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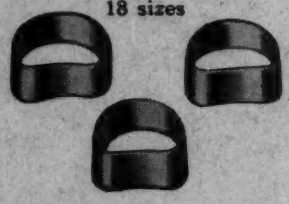

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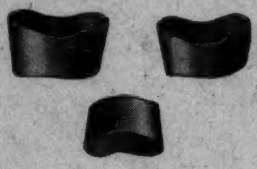

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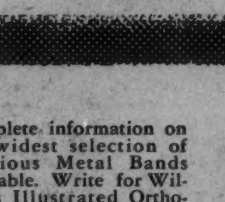

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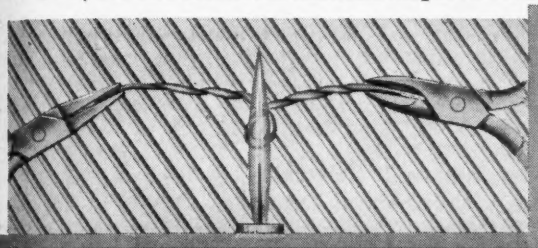

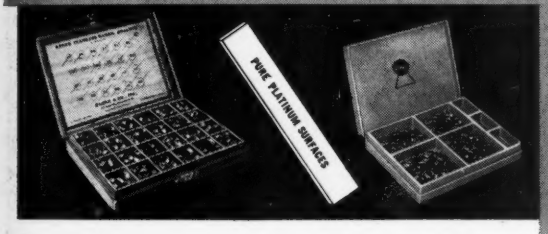

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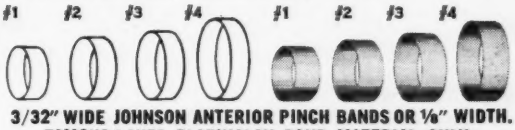

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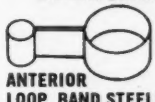

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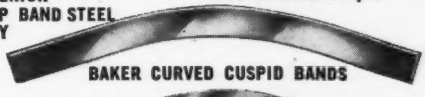

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VOL. 46 JULY, 1960 No. 7

Original Articles

DEVELOPMENT OF A TREATMENT PLAN IN THE LIGHT OF ONE'S CONCEPT OF TREATMENT OBJECTIVES

JOSEPH R. JARABAK, D.D.S., PH.D.,* CHICAGO, ILL.

FACIAL esthetics, functional harmony, and denture stability are the treatment goals of most orthodontists. Limitations imposed by the morphogenetic pattern, coupled with those of mechanics, determine in a large measure how well we achieve our treatment objectives.

Since this article outlines the treatment method that we use at Loyola University, perhaps first I should state our treatment aims: (1) to achieve tooth movements that approach normal physiology of the periodontium and alveolar bone, (2) to place teeth over apical bone, (3) to obtain a functional occlusion which will be stable and self-equilibrating, and (4) to improve facial balance and esthetics.

In principle, these are the objectives of the Tweed philosophy. We teach this philosophy, with minor exceptions, because it permits us to achieve those qualities of facial esthetics that are most pleasing to us. Furthermore, by applying the Tweed principles we are able to attain a self-equilibrating functional harmony of teeth, individually and collectively, which gives us greater denture stability. In addition, the Tweed treatment objectives are orderly and concise, and orderliness and conciseness are essential tools for teaching orthodontics to new students.

The first exception that we take to Tweed mechanics concerns the forces used to set up anchorage. For these tooth movements (second-order), light continuous forces described by Begg,[1] Storey and Smith,[18] and others, which are obtained from very resilient round wires, replace the intermittent forces of less resilient rectangular working arches. The second exception has to do with

Presented at the annual meeting of the American Association of Orthodontists in Detroit, Michigan, May 5, 1959.

*Professor of Orthodontics, Loyola University Dental School.

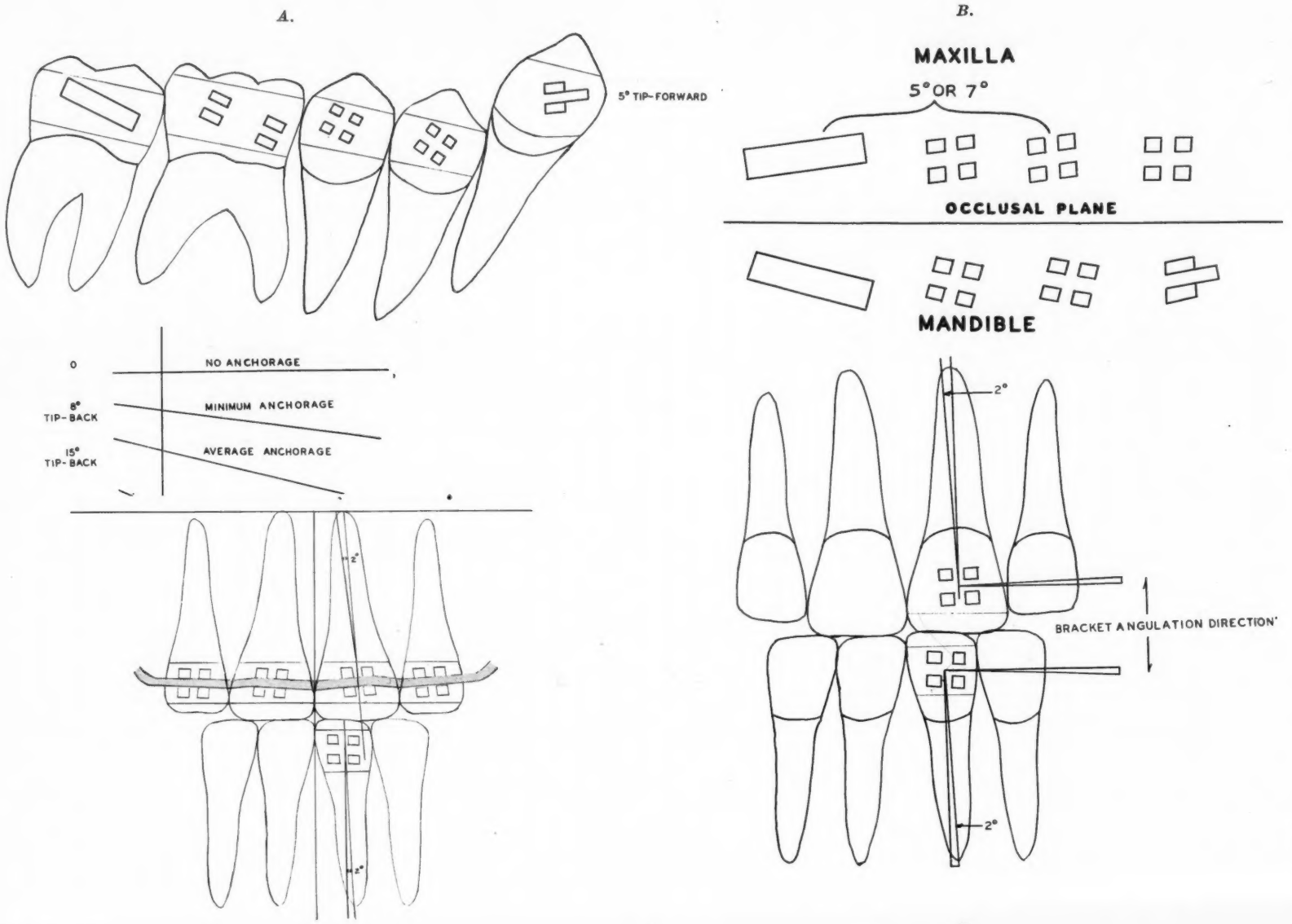


Fig. 1.—Mesiodistal bracket angulation for anterior and posterior teeth.

en masse movements of maxillary teeth in the reduction of Class II (Angle) molar relations. We make these minor changes in the Tweed technique because they reduce our treatment time and, more important, because they fit into a framework of biologic knowledge which our training compels us to accept.

This article is divided into three parts. The first part will present the biologic rationale behind the use of light resilient forces, since all first- and second-order movements (which comprise the biggest part of the treatment) are performed with light resilient arches. The second part of the article will be devoted to a description of the treatment mechanics of a nonextraction case of Class II, Division 1 malocclusion as well as a Class II, Division 1 malocclusion case in which extraction of the four first premolars is necessary. Clinical results achieved with this method of treatment will be appraised in the third part.

APPLIANCES

We use multiband edgewise appliances, since they give us the control of the teeth essential to attaining one of our treatment goals, namely, placing teeth over medullary bone and keeping them there during the remainder of the treatment.

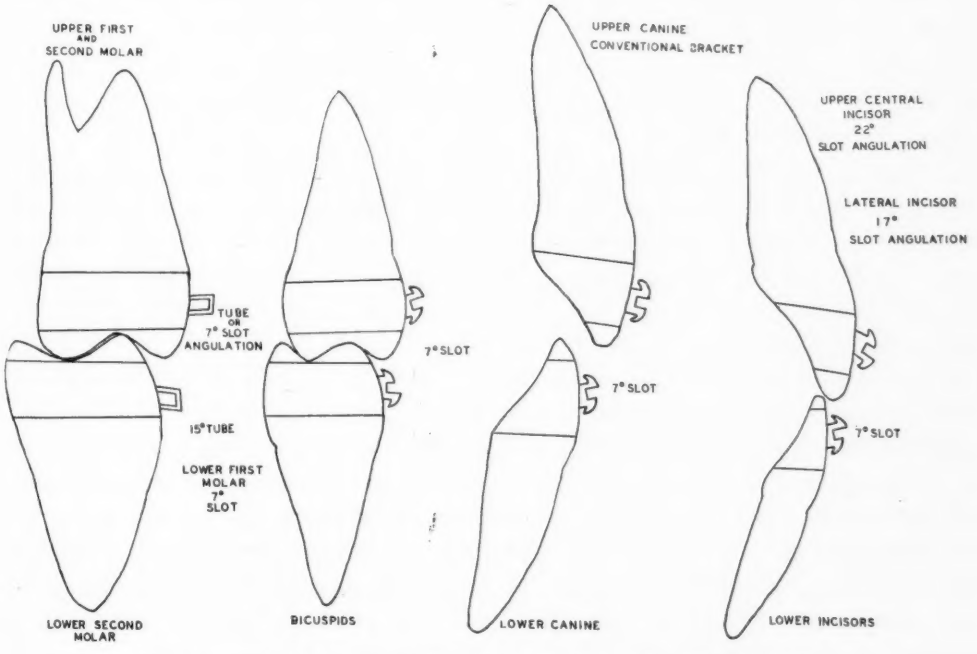


Fig. 2.—Torque slot angulation for anterior and posterior teeth.

We use brackets angulated in two planes of space (Fig. 1). The mesiodistal angulation, first described by Holdaway[4] in 1952, makes second-order mechanics possible in anterior and posterior teeth with straight light resilient wires. Angulation of the bracket-box slot makes third-order mechanics (torque) available with straight close-tolerance rectangular wires (Fig. 2). As a rule, third-order mechanics are not operational while first- and second-order mechanics are being carried out. We usually make our third-order mechanics operational

for artistic positioning of posterior teeth and for retraction of the upper anterior teeth to a desirable axial inclination while an excessive relationship of the apical bases to each other is being reduced. The latter is generally done after normal molar relations have been attained; this is the only time in the treatment that rectangular arches are used. At this time we also secure desired arch form which, incidentally, cannot be attained successfully with fine resilient arches.

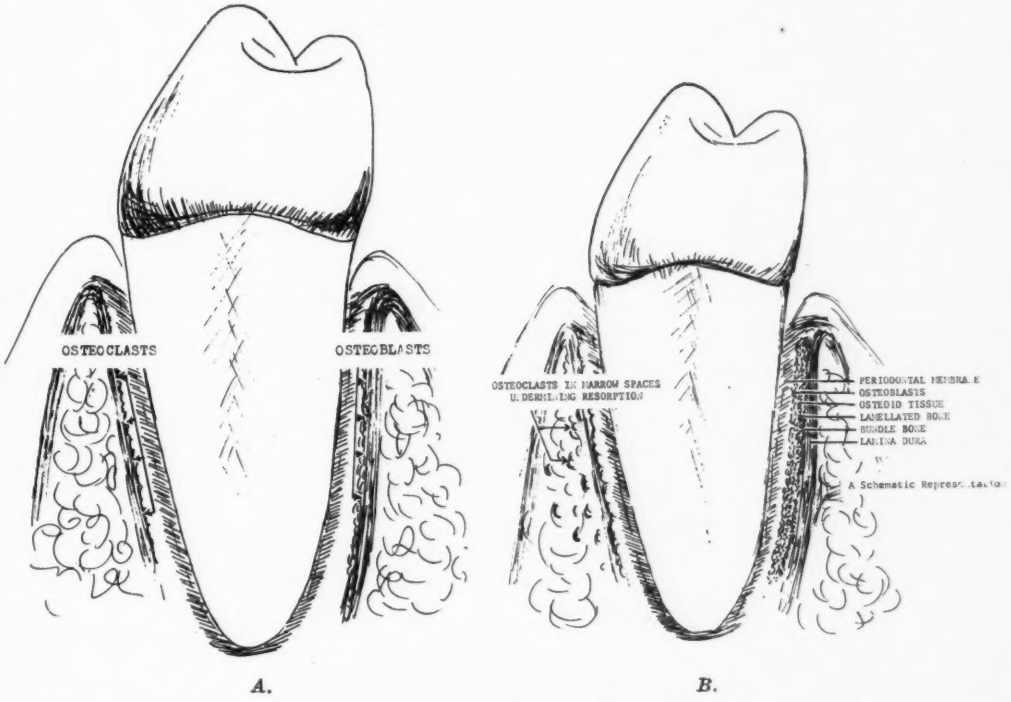
I. THE RATIONALE BEHIND LIGHT RESILIENT FORCES

Dr. Holdaway introduced me to the principles underlying bracket angulation about four years ago. Since then I have been teaching anchorage preparation in the lower resistance unit with light resilient wires. You may ask why I use light resilient arch wires when Tweed and others use much less resilient rectangular working arches to establish anchorage and to treat the remainder of the malocclusion. If I were to answer this question from a purely academic mechanical point of view, I might say that for some operators rectangular wires may be more efficient than light rectangular arches. Answering this question from the biologic or biomechanical point of view, however, I would say that forces derived from rectangular wires fitted into close-tolerance brackets impede the normal biologic processes needed for a tooth movement free from damage to bone, cementum, and roots. Excessive forces from low-resiliency wires arrest, for a time, normal physiologic activity in the periodontium and thus retard tooth movements. Light forces hasten physiologic activity and thus expedite rapid tooth movements.

Let us consider some of these biologic implications before proceeding to a description of the technique, since our clinical procedure is predicated on them. Sandstedt[12] was the first to make us aware of some of the biologic aspects of orthodontic forces. He pointed out that alveolar bone resorbs on the pressure side and new bone is apposed on the tension side. Later, Oppenheim,[8] Gottlieb and Orban,[2] Schwarz,[13] Sicher,[14] Sicher and Weinmann,[15] Stuteville,[19] Reitan,[9] Wentz and associates,[20] and others showed that the physiologic processes within the periodontium and the cellular activity in periodontal bone are influenced in different ways, depending on types of orthodontic forces used to regulate teeth. The character of this bone activity—its intensity, its sites of operation, and its expression in distances through which teeth move—is predicated in a large measure on how much we stimulate or interfere with normal periodontal physiology. The stimulus or the interference, as the case may be, to periodontal physiology depends on the intensity, the magnitude, and the duration of forces that we use to regulate teeth.

Oppenheim[8] showed experimentally that an excessive orthodontic force applied to a tooth crushes the periodontal membrane. Thus, the tooth is literally smashed against the alveolar bone. When this happens we find ruptured blood vessels, an increase in fluid content, and stasis in the crushed periodontal spaces. While this is taking place in the periodontal space, cellular activity needed for direct resorption on the pressure side and rebuilding on the tension side is hampered by the lack of nutrients supplied by a normal circulation of blood.

Thus, we may visualize how excessive forces derived from tooth-regulating appliances may temporarily cause death and considerable destruction to the periodontal ligament before cells (osteoclasts) some distance from the periodontal space are called into action. The necrotic bone blocking the tooth's movement must be removed before the tooth can advance beyond the thickness of the original periodontal membrane, which is about 0.35 mm. wide. These bone-removing osteoclasts start to work in the marrow spaces (Fig. 3), and their task is to break down and carry away the necrotic wall of bone blocking the tooth's path of movement by working from the outside toward the periodontal space. This type of bone removal is called undermining resorption.



A. *B.*

Fig. 3.—*A*, Alveolar wall interface remodeling by direct resorption. *B*, Interface remodeling by undermining resorption.

Although there is some immediate increase in bone-building activity (osteoblasts) on the tension side when excessive forces are used, it does not reach an optimum level until the necrotic wall of bone is removed from the pressure side. When this wall of bone is removed by undermining resorption, the tooth literally lunges into the space. Bundle bone, or new bone, is then laid down on the tension side to fill the void between the alveolar bone and the tooth.

If the periods between appointments are long enough, circulation in the periodontium may reach normal. While the circulation is returning to normal, other repair processes are also going on. Cementoblasts, another type of bone-building cells, start on the root surface to replace the cementum which was lost while the root was jammed against the alveolar bone.

Should another adjustment come before repair is complete, and should the forces approach the same magnitude as those used previously, the vicious cycle of crushing, undermining resorption, and repair will start over again. This sort of tooth jiggling leads to the formation of a large periodontal space filled with hyalinized connective tissue and poorly organized osteoid tissue.

The larger the periodontal space becomes (meaning that there is more hyalinized and osteoid tissue), the more mobile are these teeth. Another thing to consider is that osteoid tissue is made up largely of unpolymerized proteins and is not bone; therefore, it does not respond to forces as does alveolar bone. It just keeps increasing on either side of the tooth, resisting its movement through bone.

Tooth movements by excessive intermittent forces are not only inefficient; they are also costly to roots which resorb and to alveolar crest which is destroyed. From the standpoint of bone and alveolar crest, an ideal orthodontic force, if one could be had, would be one that would create a tempo of cellular activity on the pressure side equal to that on the tension side, allowing bone, cementum, and the intermediate plexus of periodontal space to repair as the tooth is moving.

Light forces, from fine-gauge, highly resilient straight arches or from helical-coil differential-force arches, come nearer to meeting the physiologic requirements of the periodontium than do forces which arise from the less resilient, heavier-gauge wire. Forces from light wires compress the periodontal ligament on the pressure side, while at the same time this periodontal ligament is under light tension on the tension side. If we could make these forces work ideally, we would have just enough force on the pressure side to start osteoclastic activity (direct resorption) in periodontal bone facing the root without interfering with osteoblastic (rebuilding) activity on the tension side. Another ideal situation would be to have these gentle forces working continuously for long periods, thus shortening treatment time.

Recently Storey and Smith,[18] Begg,[1] and Reitan[9] have shown that teeth move faster, over a greater distance, and with less discomfort and far less root resorption when light forces are used to regulate them.

Robinson[11] was the first to introduce vertical springs and loops. Johnson[5] pioneered clinically light forces in the twin-wire technique. More recently Halderson,[3] using free-end finger springs, Stoner,[17] using modified vertical and helical springs advocated by Storey and Smith,[18] and Kesling,[6] using U, V, and W loops described by Begg,[1] have shown that treatment time can be reduced considerably when light forces or light continuous differential forces are used. Steiner,[16] on the other hand, employs light forces by using a unique bracket design which transfers a light continuous force to a tooth when a heavier wire is engaged in the bracket slot.

Storey and Smith[18] made a detailed study of the anchorage behavior of posterior and canine teeth alike, using forces of known amounts to retract canines into the extraction sites of the first premolars. They found that forces exceeding 200 grams had a tendency to transfer anchorage from the molar resistance unit to the canine teeth. In these instances, instead of the canines

moving distally, the molars and premolars in the resistance unit moved mesially. While this was taking place in the anchor unit, the canines remained virtually stationary until undermining resorption in the bone surrounding the canines was nearly complete.

The refusal of the canines to move distally and the mesial movement of teeth in the resistance unit when heavy forces are applied to the canines can be explained readily. Reitan[9] has shown that the lack of cellular activity, later followed by hyalinization in the periodontal ligament, is one of the first signs of orthodontic forces exceeding 200 grams. Thus, if excessive forces are applied to the canines, cellular activity needed for direct alveolar-wall resorption and the movement of the canines are temporarily halted. On the other hand, what may be an excessive force on the canines, spread out over a greater area of supporting bone of the teeth in the resistance unit, approaches physiologic requirements of forces for these teeth. Here direct resorption, the most immediate and efficient bone response to a lighter orthodontic force, begins to occur within twenty-four to thirty-six hours while the less efficient and more time-consuming undermining resorption has not yet started to remove crushed and necrosed bone. This explains why there is anchorage breakdown in the resistance unit while canines are being retracted with excessive forces. The converse of this is true (that is, the resistance unit remains virtually stable while the canines move distally) when light forces are used for canine retraction.

Although I have said a great deal about the biologic reaction of bone to light and excessive forces, I have not yet placed measurable values on them. In order that the terms "light forces" and "excessive forces" may have the same meaning for each of us, I shall translate them into tangible values. A light force is one in the order of 1 to 4 ounces (27.7 to 110 grams). A force in the intermediate range is from 5 to 6 ounces. Beyond these values, the forces are excessive for a normal cellular response in bone. Although these values state clearly what is meant by light, intermediate, and excessive forces, how do these values compare with some of the forces that we use clinically when rectangular arches are employed? By way of comparison, let us consider first the force which an activated Bull or Strang loop will generate. Next let us see how much force it takes to seat a second-order bend that has a 2 mm. cant from the sagittal plane of the wire.

If we use 0.021 by 0.025 inch steel wire to construct a Bull loop, the force arising from it is 16 to 23 ounces when activated, the thickness of a "thin dime." The force from a Strang loop made of round wire is somewhat less, depending on the size of the loop and the gauge of the wire. It frequently takes as much as a 3 pound force to seat a second-order lever that has a 2 mm. cant. I consider all these forces excessive, taxing on the resistance unit, and far from conducive to normal cellular periodontal response.

Having shown why light forces are more efficient and biologically sound, I would like to state that, as our technique is presently set up, we use light forces for all first- and second-order mechanics during anchorage preparation and also for the distal retraction of upper buccal segments in the reduction of Class II molar relationships. The only time that we use forces which might be termed

"excessive" or "intermittent" is when we use a torque force toward the end of treatment to reduce an excessive AB relationship and to ascertain final arch form.

II A. TREATMENT PROCEDURE FOR CLASS II, DIVISION 1 MALOCCLUSION CASES IN WHICH TOOTH EXTRACTION IS NOT REQUIRED

The treatment of Class II, Division 1 malocclusion, where the total discrepancy in the lower arch does not exceed 4 mm., is divided into six steps:

1. Anchorage preparation in the lower resistance unit.
2. Correction of slight anterior rotations and retraction of lower anterior teeth to a position over the apical base.
3. Retraction of upper buccal segments to establish normal molar relationships.

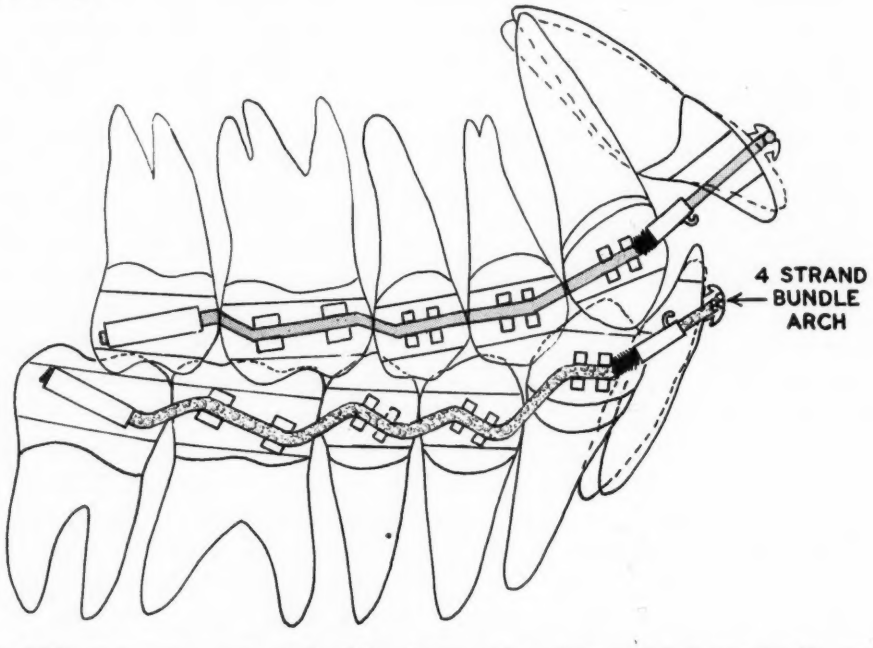


Fig. 4.—An 0.016 inch upper arch and sliding hook and a four-strand lower bundle arch (Fogel-Magill) and sliding hook.

4. Reduction of excessive labial inclination of the four upper anterior teeth to approximately 112 degrees to the Frankfort horizontal plane, or 22 degrees to the NA plane.[16]
5. Maintenance of this angle with a close-tolerance rectangular wire while the four upper anterior teeth are retracted bodily with high-pull headgear and Class II mechanics which reduce the AB relationship.
6. Space consolidation (if needed).

Anchorage Preparation.—Anchorage preparation according to the Tweed technique is done with Class III mechanics to the lower arch and headgear

to the upper arch. This has been modified to fit the resilient-wire technique. An extraoral, headgear force alone is used for anchorage preparation with the light-resilient-wire technique. Intraoral Class III elastics have been dispensed with because of their reciprocal action on the upper teeth, which we feel cannot be offset with a headgear to the upper arch worn only at night. After the posterior teeth have been tipped distally, headgear mechanics are continued until the four lower anterior teeth are over the apical base.

Either an 0.016 inch highly resilient arch or a Fogel bundle arch, to which have been added two sliding hooks and two short sections of coil spring, is woven into the angulated brackets of the lower teeth (Fig. 4). This arch is formed with at least ½ inch expansion (preferably more) on each side to offset the lingual lash of headgear mechanics. The sliding hooks are placed between the lower canine and incisor teeth. If the desired distal angulation needed for anchorage preparation is not achieved in six to eight weeks, this wire is replaced with an 0.018 inch wire for another four weeks. Usually, by this time the teeth have tipped distally about as much as the brackets are angulated.

Fig. 5.—Angulation in lower resistance unit after anchorage preparation.

A lateral headplate tracing illustrates the degree of anchorage preparation, and intraoral roentgenograms show that the fulcrum for this distal tipping is near the apices of these teeth (Figs. 5 and 9, *A* and *B*).

After anchorage is prepared in the lower resistance unit, the mandibular arch is replaced with one of the same size, into which intermaxillary hooks have been bent. These hooks are located between the lower lateral incisors and canines and are directed incisally. This arch is used in conjunction with headgear to place the lower anterior teeth over the apical base. Headgear traction is used at night, and a 3 ounce pull from intramaxillary rubber-dam elastics is used during the day. Lower incisors are usually retracted to a correct position

over the apical base in six to eight weeks. When this is accomplished, the lower arch is replaced with an 0.021 by 0.021 inch stabilizing arch to which Class III hooks are soldered in the canine region and stops are placed 1 mm. mesial to the molars. Thus, the teeth in the lower arch are prepared to act as a fixed-resistance unit against Class II mechanics.

Upper Buccal Segment Retraction.—At the beginning of anchorage preparation in the lower arch, an 0.016 inch arch was woven into brackets of the teeth in the maxillary arch. On this arch were two sliding hooks and two short coils distal to the hooks. These were between the canine and the first premolar.

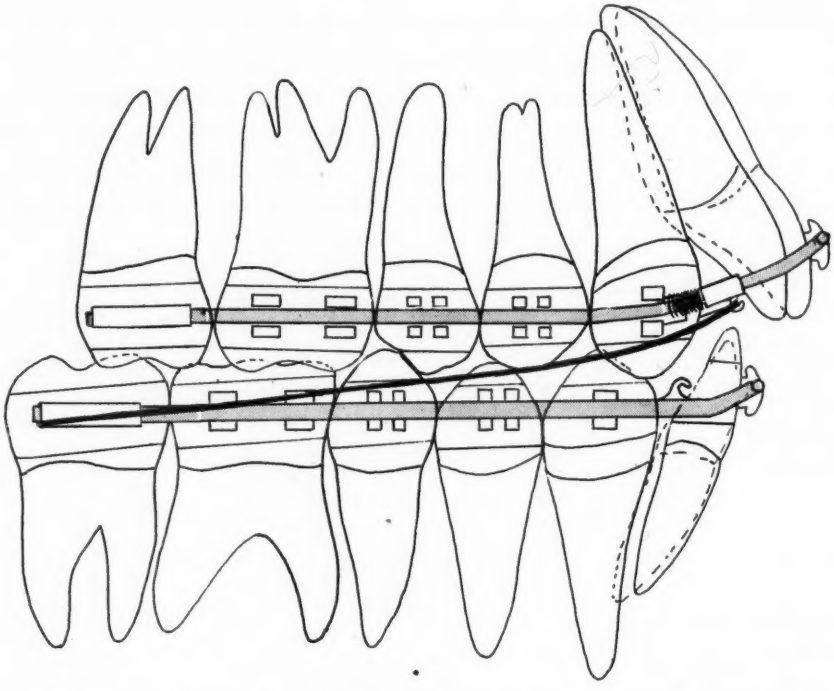


Fig. 6.—Distal-drive mechanics correct anteroposterior molar relationship.

Assuming that the arch wire was not deformed by the correction of rotations of maxillary teeth while anchorage was being prepared in the lower arch, Class II intermaxillary elastics with no more than a 4 ounce pull (¼ inch heavy rubber-dam elastics) are now attached to the sliding hooks (Fig. 6). These mechanics tip the posterior teeth distally. They are continued until a normal interdigitation of posterior teeth is obtained. Concomitant with these mechanics in the maxillary arch, headgear attached to the lower arch is worn at night to support the lower anchorage unit. It was found that Class II light elastics do not disturb the lower anchorage unit, if cooperation with the headgear should be lacking, as much as would heavier-pull elastics. At the same time, they reduce the Class II molar relationship almost as effectively.

After normal cuspal interdigitation is obtained in the posterior teeth, the sliding hooks are advanced to lie between the upper canine and the lateral

incisor. Class II mechanics are continued until the canines are retracted distally and are in normal relationship to the teeth in the lower arch.

Reduction of Excessive Inclination of Upper Incisors.—The arch wire with the sliding hooks is now replaced with another 0.016 inch arch into which intermaxillary hooks have been bent between canine and lateral incisor teeth. Class II intermaxillary elastics are then worn until the upper incisors are tipped distally to 112 degrees from the Frankfort horizontal plane (Fig. 7). If one chooses to use Steiner's more accurate method for assessing upper incisor axial inclination to maxillary apical base, then the distal tipping is carried to 22 degrees to the NA plane.

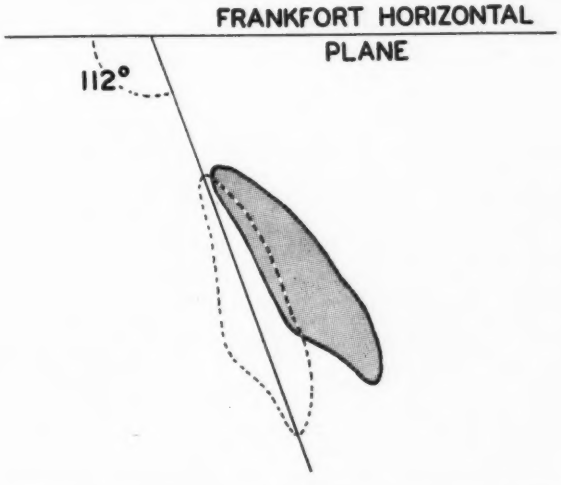


Fig. 7.—Upper incisor inclination at which torque mechanics begin in upper arch.

Bodily Retraction of Upper Incisors.—Assuming that the upper incisors have been tipped back to the desired axial inclination, or were already there, the upper 0.016 inch arch is replaced with an 0.022 by 0.028 inch upper rectangular arch (Fig. 8). This arch is reduced anodically to about 0.016 by 0.022 inch from the canines posteriorly. Four hooks are soldered to this arch—one pair between the canines and lateral incisors (incisally) and a pair of high-pull headgear hooks (gingivally) between the lateral and central incisors.

This arch has a very close-tolerance fit in the torque slot brackets of the upper anterior teeth; simultaneously, its reduced size in the posterior region offers little resistance to its sliding posteriorly through the brackets in the buccal segments. A word is in order regarding the need for a close-tolerance bracket-to-wire fit. For each 0.001 inch clearance, there is a torque loss of from 3 to 5 degrees. It must be remembered that the more wire-to-bracket clearance there is in the anterior brackets, the less effective will be the torque force.

When the high-pull headgear is used in conjuction with Class II elastics, it is desirable to have at least twice as much high-pull force as Class II force being exerted by the intermaxillary elastics. Light 4 ounce Class II intermaxillary

rubber-dam elastics are used when the headgear is not worn. If one adheres strictly to these mechanics, it is possible to reduce considerably an excessive discrepancy in the relationships of apical bases.

Space Consolidation.—If spaces still remain after the upper anterior teeth have been retracted and the molar relationships have been corrected, these are now consolidated with an 0.021 by 0.025 inch upper arch. High-pull headgear hooks and stops 1 to 2 mm. anterior to the molar tubes are soldered to the arch. Before the stops are soldered, short sections of open-coil springs are placed on either side of the arch. These are compressed with tie-back ligatures to the molar teeth. The forces from the coil springs, together with those from the headgear and the torque from the wire in the posterior torque-slot brackets, consolidate the arch and seat the teeth into good occlusion.

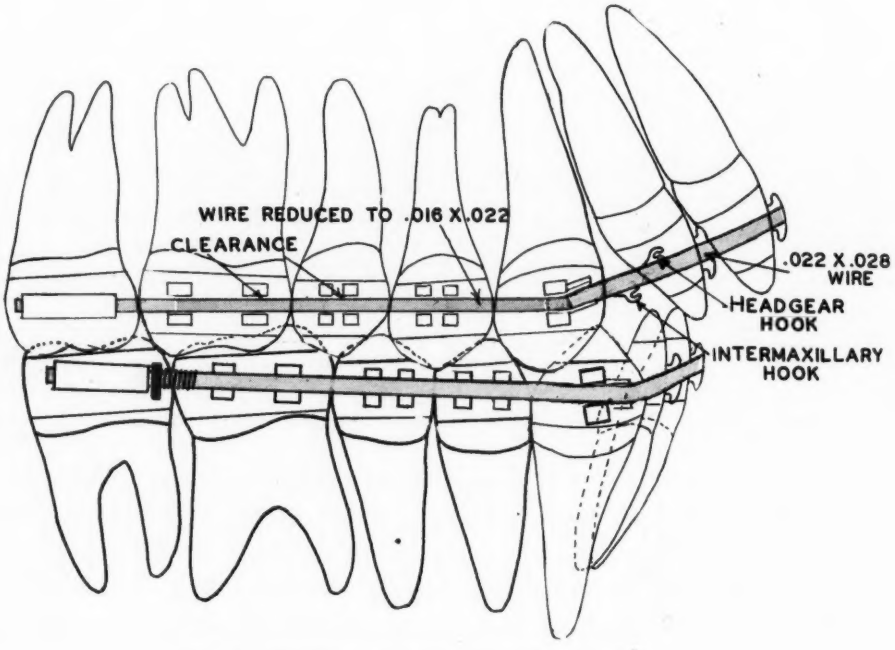


Fig. 8.—Maxillary incisor torquing arch.

II B. TREATMENT OF MALOCCLUSIONS REQUIRING PREMOLAR EXTRACTIONS

Treatment of extraction cases is divided into three steps:

1. Simultaneous retraction of four canines and uprighting and distal tipping of the teeth in the resistance units.

2. Space consolidation and establishment of normal molar relationships.

3. Correction of axial inclination of upper anterior teeth and establishment of normal inclined-plane relationship of posterior teeth.

Anchorage preparation by the conventional method, in which Class III mechanics to the lower arch and headgear to the upper arch are used, usually

is not required in the treatment of extraction cases when light forces are used. Anchorage is not taxed during space consolidation and reduction of Class II molar relationships if the sum total of intermaxillary and intramaxillary forces does not exceed 5 ounces. These statements are made with two reservations: (1) anchorage preparation is not necessary, provided angulated brackets are used to upright and/or tip back the teeth in the resistance unit, and (2) total discrepancy between arch length and tooth size does not exceed 14 mm.

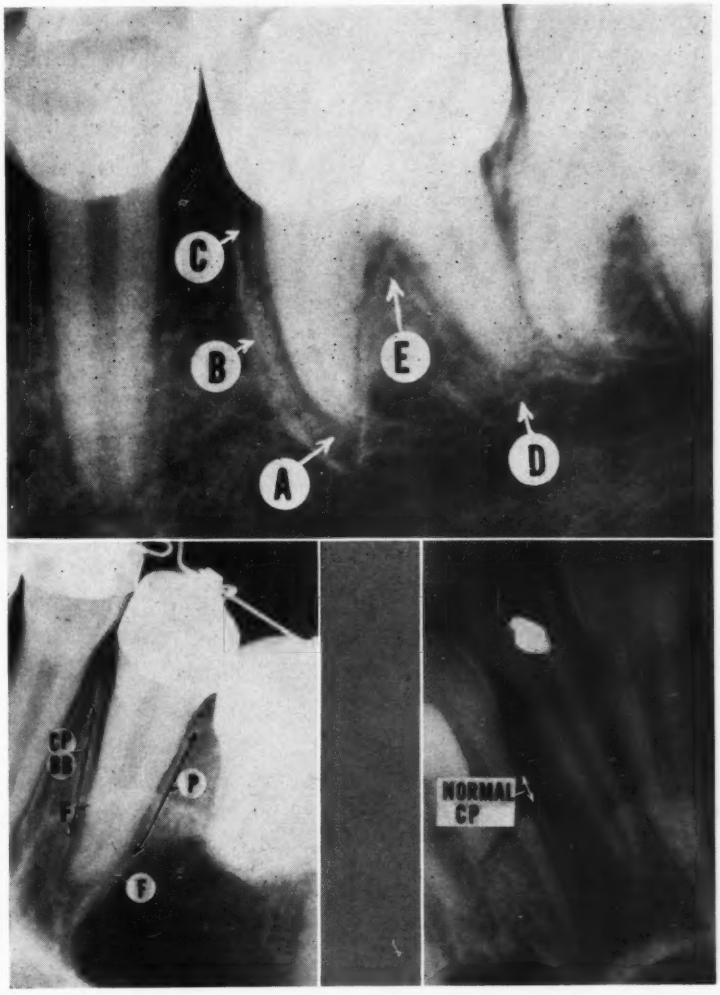


Fig. 9.—Molars and premolars after anchorage preparation. Thickness of cribriform plate at *C* and *B* and relationship of root to alveolar fundus at *A* indicate tooth tipping distally on fulcrum *D* (molar).

The tipping back of the lower teeth in the posterior segment in the light-resilient-wire technique is done by weaving a highly resilient wire, generating light forces into angulated brackets. These light-wire forces are reinforced with triangularly placed intermaxillary elastics which span the teeth in the resistance unit.

Some may argue that these mechanics will tip the molar and premolar roots forward. Intraoral roentgenograms of the root areas during these mechanics convince us that lower molars upright about a fulcrum somewhere near the apices of the distal roots. At the same time, the premolars tip distally about a fulcrum in the lower third of their roots (Fig. 9).

Simultaneous Retraction of Four Canines and Uprighting of Teeth in Resistance Units.—Simultaneous retraction of the four canines is usually done in one of two ways. The method of choice is determined by the position of the canine and the alignment of the remaining upper anterior teeth. If the upper anterior teeth are in good alignment, the upper canines are retracted along an 0.016 inch arch with 4 ounce intermaxillary elastics attached to sliding hooks. The hooks are placed ahead of small coil springs to reduce the possibility of binding them between arch and bracket (Fig. 10). Unless the sliding hooks are kept free, friction develops between wire and bracket and the canines tip distally instead of moving bodily along the arch wire.

Fig. 10.—Distal-driving upper canines with elastics attached to sliding hook.

In those malocclusions in which there is a severe loss of arch length and in which upper and lower anterior teeth are severely rotated and canines have erupted high and to the labial side, helical torsion springs or Begg vertical springs are used to retract the canines and align the remaining upper anterior teeth simultaneously. Treatment time is thus reduced substantially. To illustrate the efficiency of these mechanics, let us examine a malocclusion in which this was done (Fig. 11).

This Class II malocclusion was complicated by a serious loss of arch length, and it was further complicated by the presence of two supernumerary teeth between the upper incisors. A helical-torsion maxillary arch was designed to do the following things simultaneously: (1) retract and elongate the upper canines, (2) correct the mesiodistal axial inclinations of the remaining upper anterior teeth, (3) reduce the upper lateral incisor elongation, and (4) start the correction of rotations of the four anterior teeth. After twelve weeks and two appliance adjustments, the case had progressed to the point shown in Fig. 12.

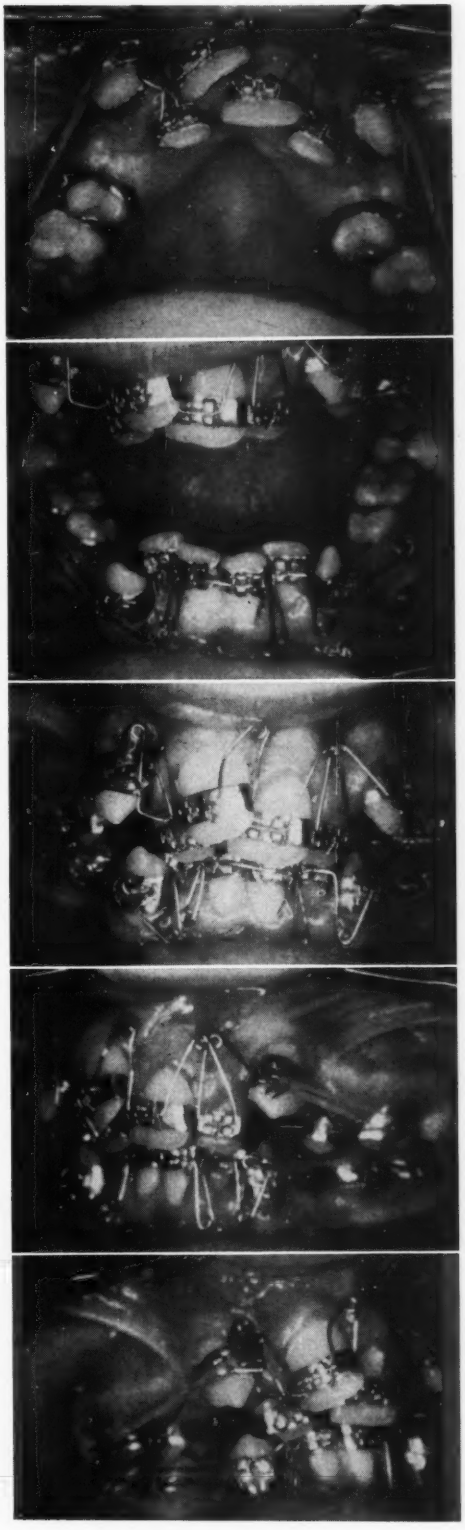


Fig. 11.—Vertical helical loop appliance at beginning of treatment.

Fig. 12.—Amount of correction obtained with vertical loop appliance in twelve weeks with one appliance adjustment.

Regardless of which of the two methods is used to retract the canines, the teeth in the lower resistance units are being uprighted simultaneously. This is done by attaching 4- to 6-ounce-pull vertical elastics from the distal side of the upper molar buccal tube anteriorly to a gingival hook on the upper second premolar. From there the elastic spans to a gingival hook on the lower second premolar band. This elastic forms a triangle that has a vertical and a Class III force component.

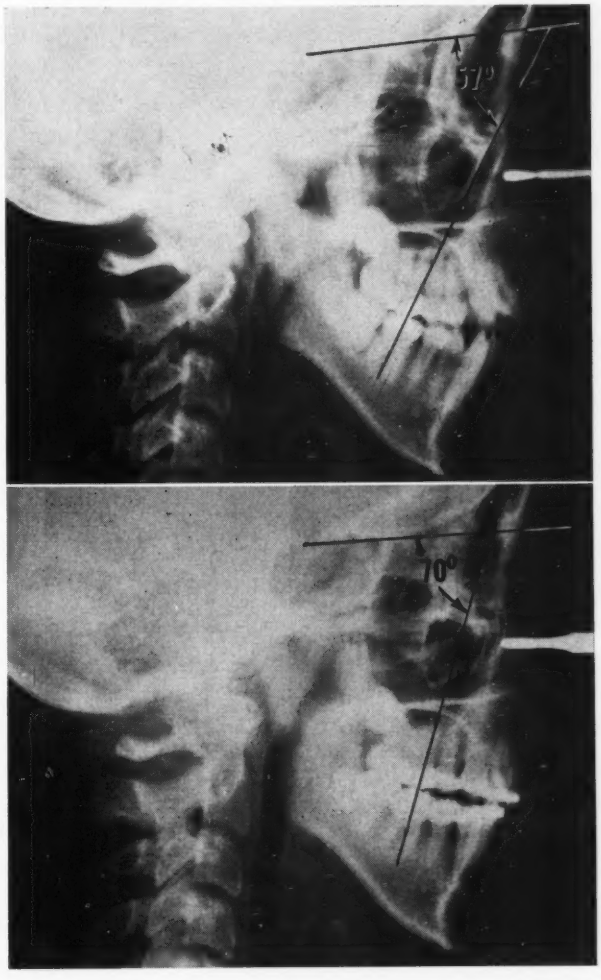


Fig. 13.—Degree of distal tipping accomplished with triangularly placed elastics in resistance units.

By comparing lines drawn through the long axes of the molars on progressive lateral headplates, we can determine how much of the distal tipping in the resistance unit can be attributed to these mechanics (Fig. 13). If tracings are superimposed on SN, we can measure the number of degrees these teeth have tipped by drawing a line through the long axes of the lower

molars. By adding to this information that revealed by the intraoral x-ray, we can determine quite accurately where the fulcrum for this tipping action lies (Fig. 9, *A* and *B*).

Space Consolidation and Establishment of Normal Molar Relations.—After the canines have been tipped distally and the remaining anterior teeth have been aligned for bracket engagement, the helical-torsion arches are replaced by 0.016 inch space-consolidation arches. Consolidation arches have intermaxillary hooks bent into them, between the lateral incisors, and canines.

Intramaxillary elastics are attached to both arches to start space consolidation (in Class I cases). If the molars are still in a Class II relationship, intermaxillary elastics (in addition to the intramaxillary elastics in the lower arch) are worn to reduce the Class II molar relationship. It must be remembered that during this time the combined elastic pull should not exceed 4 ounces. It is necessary, therefore, to use the ¼ inch light rubber-dam elastics, which have about a 2 ounce pull, for both intermaxillary and intramaxillary mechanics. Forces greater than these will cause a "rabbiting" of upper anterior teeth and excessive mesial tipping of the teeth in the resistance unit. Such mechanics invariably cause excessive vertical overclosure of anterior teeth.

Should the lower second premolars be depressed at this point in treatment, quadrate elastics may be attached to the molar arch wire extension and to gingivally bent vertical pigtail hooks formed from the ligature ties of these teeth.

When space consolidation reaches the point where upper incisors are in a correct axial inclination and molars are in normal mesiodistal relationship, the upper arch is replaced with an 0.022 by 0.028 inch arch which has been reduced in the posterior region to 0.016 by 0.022 inch. This arch serves the same purpose as that described for the nonextraction treatment, namely, torque control of upper anterior teeth.

The lower arch, if arch form requires, is also replaced with an 0.021 by 0.025 inch ideal rectangular consolidation arch.

Two headplates (Fig. 13)—one taken at the beginning of treatment and one just before the last stage of treatment (prior to the placing of rectangular arches)—illustrate the paralleling of roots on either side of the extraction site. They also show that the molars have not drifted forward and that the lower anterior teeth overlie basal bone. This progress in treatment was achieved with the light forces during an eight-month period, without headgear or Class III mechanics to set up anchorage. The distally tipped teeth in the lower resistance unit are still very much in evidence, even though intramaxillary elastics were worn all the time that these teeth were uprighting and tipping distally.

Intraoral roentgenograms show a small amount of forward root movement in some instances (Fig. 14). Tweed once said that posterior teeth migrate into the extraction site during canine retraction, even with the best mechanics. Here this forward movement was minimal during anchorage preparation, even though Class III or headgear mechanics were not used. A study of serial headplates shows that the posterior teeth migrated forward very little, if at all,

during treatment with light forces. If they do move mesially, the amount of forward movement is considerably less, however, than when forces from Bull or Strang loops are used to retract canines and to consolidate spaces. One other factor, equally as important as the stability of the lower posterior teeth, is the fact that very little or no visible root resorption occurs during treatment. The intraoral x-ray evidence also shows that the periodontal space remains small during treatment. This means that apposition and resorption are going on at nearly the same pace.

Fig. 14.—Periodontal space of normal width during orthodontic tooth movement. Bone destruction and repair are going on at an even pace.

III. APPRAISAL OF FINISHED RESULTS

In appraising the finished results of treatment with the light-wire technique as we applied it to the Tweed philosophy, we took into consideration the relationship of upper and lower teeth to the apical bases as well as to denture esthetics and functional stability.

With regard to our first consideration (the relationship of upper and lower teeth to their respective apical bases), Lindquist[7] describes a group of measurements relating the lower incisor teeth to the mandibular apical base which lend themselves ideally to an appraisal of our treated results. In addition to these, we related upper incisors to the maxillary apical base, using Steiner's values for the relationship of the upper central incisor to the NA plane and the upper central incisor to the Frankfort horizontal plane. Since we were also interested in the direction of growth, as well as in growth increments during treatment, we added Downs's Y axis to our evaluation of treated cases.

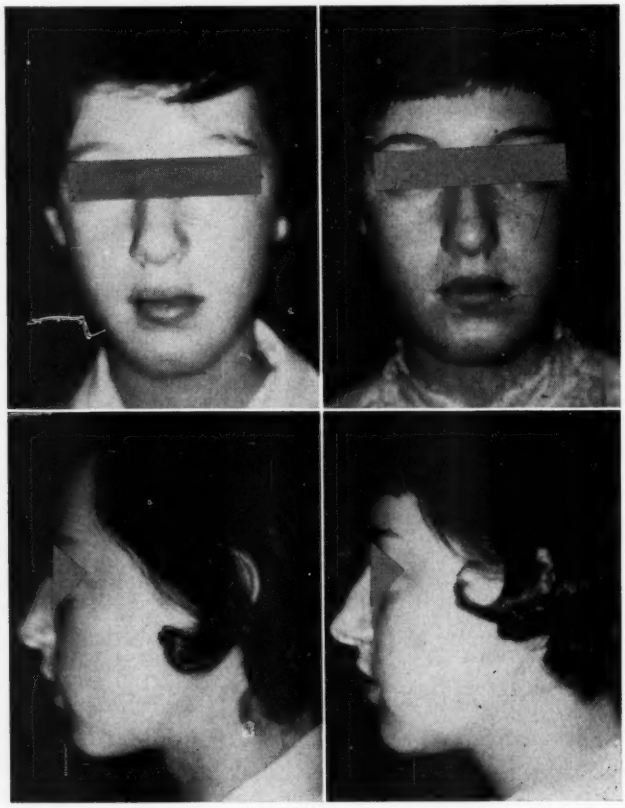
I have selected six cases as a test of the treatment method outlined in the second part of this article. Three were nonextraction cases, and three were treated after the first premolars had been extracted.

CASE 1.—A girl, aged 11 years, 9 months, with a Class II, Division 1 subdivision malocclusion was selected specifically to test the light-resilient-wire treatment mechanics, since there was a large discrepancy between tooth material and apical base. Treatment of such malocclusions usually requires considerable tooth movement.

The tooth discrepancy was 11 mm. in the lower arch and 9 mm. in the upper arch. Four first premolars were extracted to facilitate alignment and placement of the remaining teeth over apical bases.

Although maxillary and mandibular apical base values fall somewhat below the mean (Table I), a more significant feature of this morphogenetic pattern is the relationship between these bases (ANB 6). This, coupled with a fairly steep Frankfort-mandibular plane angle, creates a notably backward-divergent face (Fig. 15, *A* and *B*). This fact is further substantiated by the cant of the Y axis to the Frankfort horizontal plane.

A.



B.

Fig. 15 *A* and *B*.

TABLE I. CASE 1

ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	76°	74°	82.01°
2. SNB	70°	71°	79.97°
3. ANB	6°	3°	2.04°
4. FMA	34°	33°	25°
5. IMPA	89°	90°	90°
6. FMIA	57°	56°	65°
7. Occlusal plane	6°	9°	9.3°
8. Central incisor to A-Po	2 mm.	2 mm.	0
9. Central incisor to NB (mm.)	6 mm.	4 mm.	4 mm.
Po to NB	2 mm.	3 mm.	
10. Central incisor to NB (angular)	27°	27°	25°
11. Y Axis—linear (growth)	123 mm.	131 mm.	
12. Y Axis—angular (axial relation)	64°	63.5°	
13. Upper central incisor to Frankfort plane	114.0°	111.0°	
14. Upper central incisor to NA (angular)	25°	21°	22°
15. Upper central incisor to NA (mm.)	6 mm.	4 mm.	4 mm.

The teeth in this denture are irregular, illustrating the inadequacy of apical base to accept the existing tooth material. The upper canines are erupting high, and there is a unilateral cross-bite of the teeth in the buccal segment, which also show excessive lingual inclination (Fig. 15, *A* to *D*, before treatment).

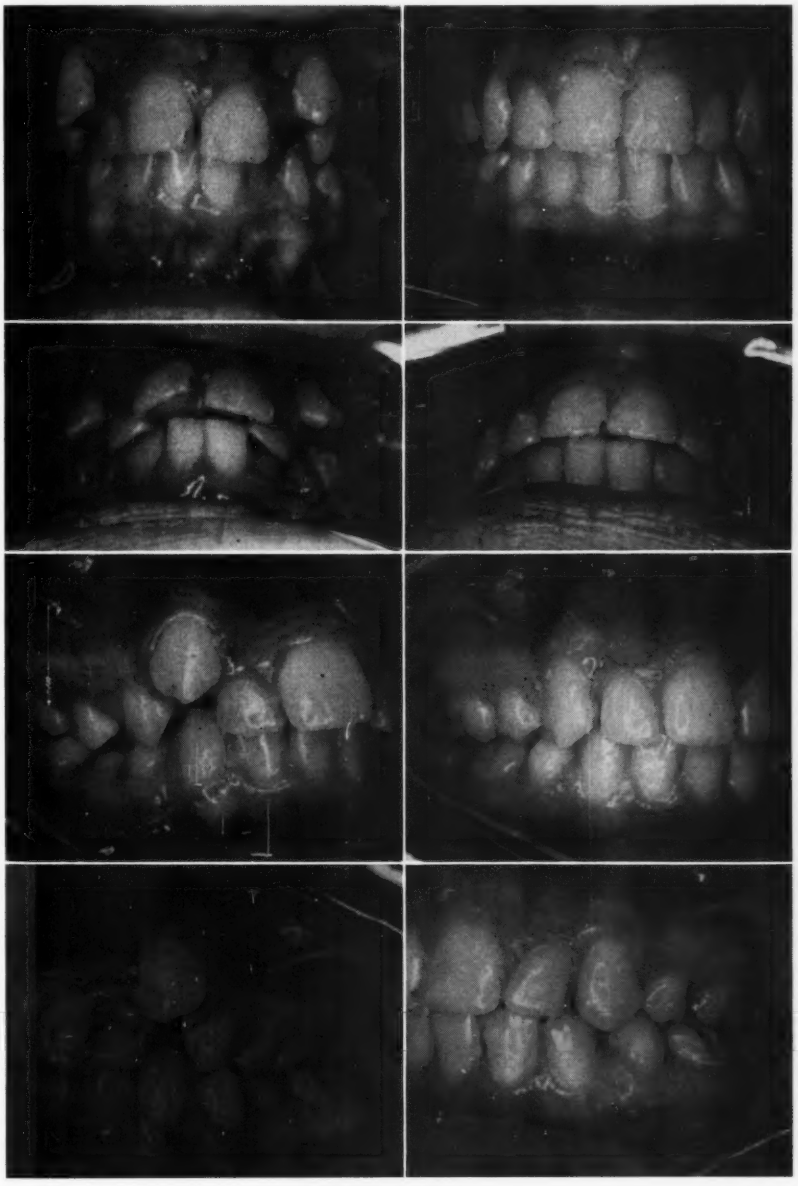


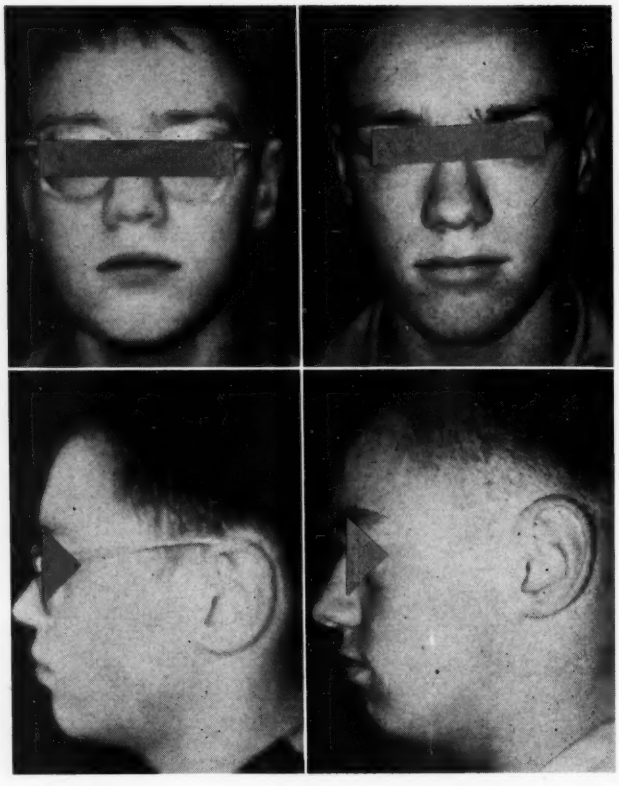
Fig. 15 *C* to *F*.

Although facial esthetics improved somewhat during treatment, I would like to attribute this to the "growing-up" of the patient rather than to the orthodontic treatment.

The reduction in the ANB difference may have been instrumental in some of the facial improvement, as no doubt was the improved relationship between the lower central incisor and pogonion (central incisor to NB:Po to NB—before treatment 6:2 mm., after treatment 4:3 mm.). The rest was due to the "growing-up" process.

The major improvements in this case center about the denture, shown in the after-treatment records (Fig. 15, *A* to *D*). Will this denture remain stable? Although preliminary equilibration by judicious removal of cuspal interferences has already been achieved, there are no signs to indicate that self-equilibration has yet started. This leads me to believe that retention, at least in the maxillary arch, will be prolonged. The teeth in the mandibular arch, although not retained, seem to be stable.

A.



B.

Fig. 16 *A* and *B*.

TABLE II. CASE 2

ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	79.8°	76.5°	82.01°
2. SNB	75.6°	75.5°	79.97°
3. ANB	4.2°	1.0°	2.04°
4. FMA	29.5°	29.5°	25°
5. IMPA	94.2°	93.4°	90°
6. FMIA	55.7°	56.6°	65°
7. Occlusal plane	11.6°	9.6°	9.3°
8. Central incisor to A-Po	2.5 mm.	5.5 mm.	0
9. Central incisor to NB (mm.) Po to NB	2.5 mm. (6.5:2.5 3:1)	3 mm. (7.5:3)	4 mm.
10. Central incisor to NB (angular)	27.6°	26.4°	25°
11. Y Axis—linear (growth)	130.5 mm.	141.0 mm.	
12. Y Axis—angular (axial relation)	63.0°	64.5°	
13. Upper central incisor to Frankfort plane	127.3°	105.0°	
14. Upper central incisor to NA (angular)	29.5°	21.0°	22°
15. Upper central incisor to NA (mm.)	10 mm.	9 mm.	4 mm.

CASE 2.—The patient was a boy, aged 12 years, 3 months, with a Class I open-bite. This was a nonextraction case.

The face in this case, like the previous one, shows some backward divergence (Table II, SNA 79.8 degrees, SNB 76.5 degrees) (Fig. 16, *A* and *B*, before treatment).

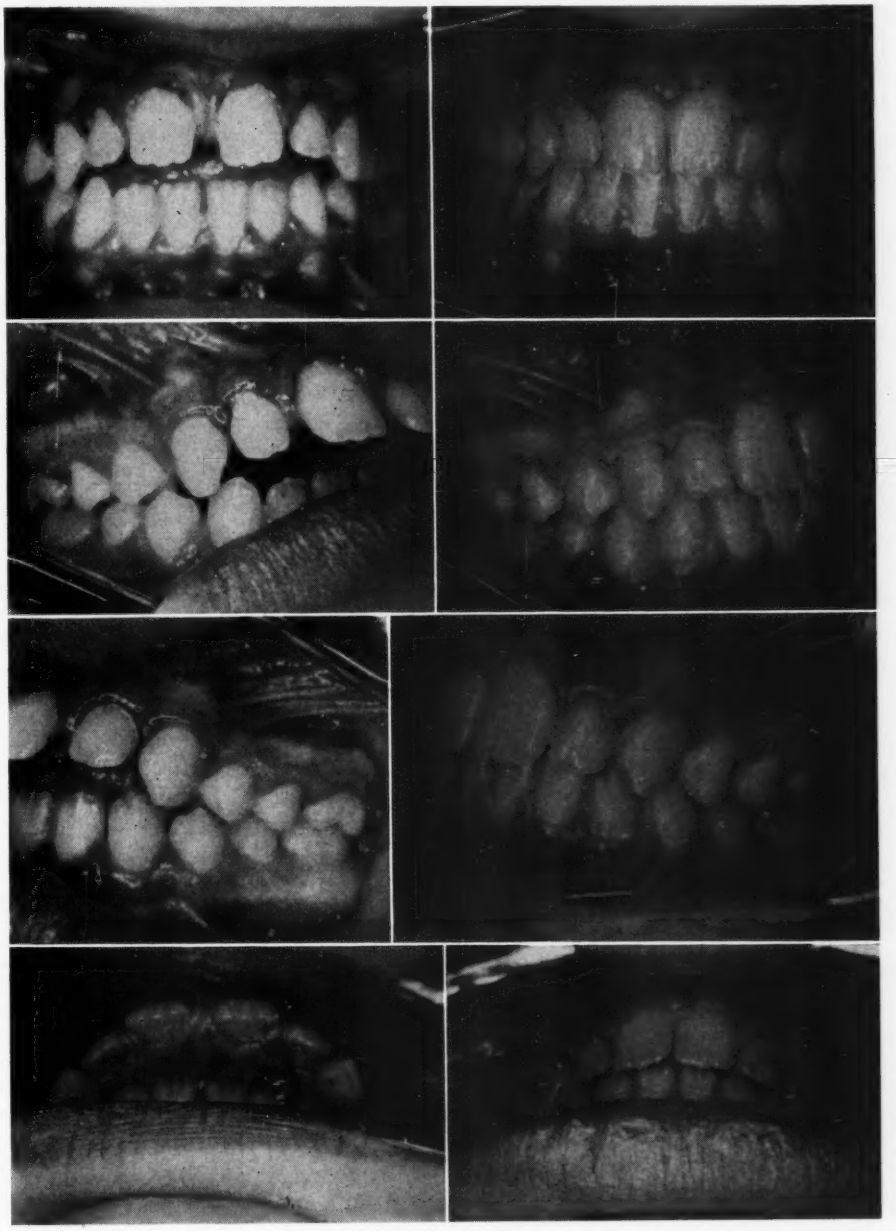


Fig. 16 *C* to *F*.

The most notable features of this malocclusion were the open-bite and excessive labioversion of the upper anterior teeth (Fig. 16, *D* to *F*, before treatment). These features are corroborated in the cephalometric record by the large value for the angle of the upper central incisor to Frankfort horizontal plane (also upper central incisor to NA, 29.5 degrees).

This patient grew considerably during treatment (Y axis, linear, 10.5 mm.). The most obvious benefit obtained from orthodontic treatment was the reduction of the axial inclination of the upper anterior teeth (upper central incisor to Frankfort plane, 127.3 to 105 degrees or upper incisor to NA, 29.5 to 21 degrees).

The facial photographs taken after treatment show that the soft-tissue contours about the lips, for which the teeth act as a scaffolding, are in a harmonious balance with the rest of the face (Fig. 16, *A* and *B*).

After-treatment intraoral photographs reveal the teeth to be in normal occlusion (Fig. 16, *C* to *F*). Their inclined planes are well oriented in a horizontal and transverse plane for self-equilibration, which has already begun in the canine, premolar, and molar areas. If this self-equilibration continues, the denture will remain stable with minimum retention.

CASE 3.—The patient was a boy, aged 13 years, 5 months, who had a Class II, Division 1 malocclusion which did not require tooth extraction.

Although the large ANB difference might lead one to suspect that this would be a difficult malocclusion to treat, a closer study of the relationship of parts which make up this face brighten the treatment outlook (Table III).

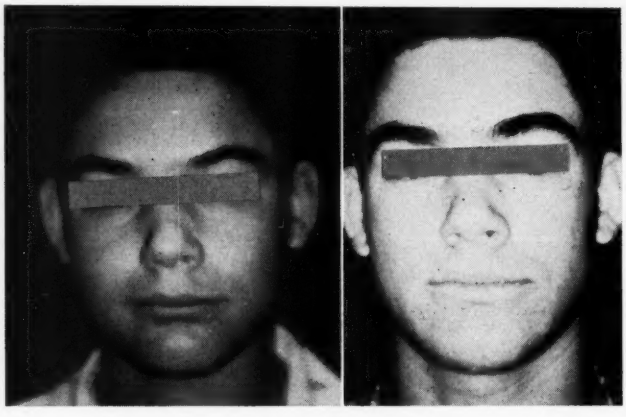


Fig. 17 *A*.

TABLE III. CASE 3

ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	83°	80.5°	82.01°
2. SNB	76.6°	79.2°	79.97°
3. ANB	6.4°	1.3°	2.04°
4. FMA	17.5°	17.5°	25°
5. IMPA	100.5°	89.4°	90°
6. FMIA	62°	73°	65°
7. Occlusal plane	1.5°	0°	9.3°
8. Central incisor to A-Po	26.4°	23.5°	0
9. Central incisor to NB (mm.)	3.5 mm.	3.5 mm.	4 mm.
Po to NB	4.5 mm. (3.5:4.5)	5.5 mm. (3.5:5.5)	
10. Central incisor to NB (angular)	26.7°	18°	
11. Y Axis—linear (growth)	129.5 mm.	146 mm.	
12. Y Axis—angular (axial relation)	51°	51°	
13. Upper central incisor to Frankfort plane	128.5°	118.7°	
14. Upper central incisor to NA (angular)	34.4°	27.5°	22°
15. Upper central incisor to NA (mm.)	7.5 mm.	6 mm.	4 mm.

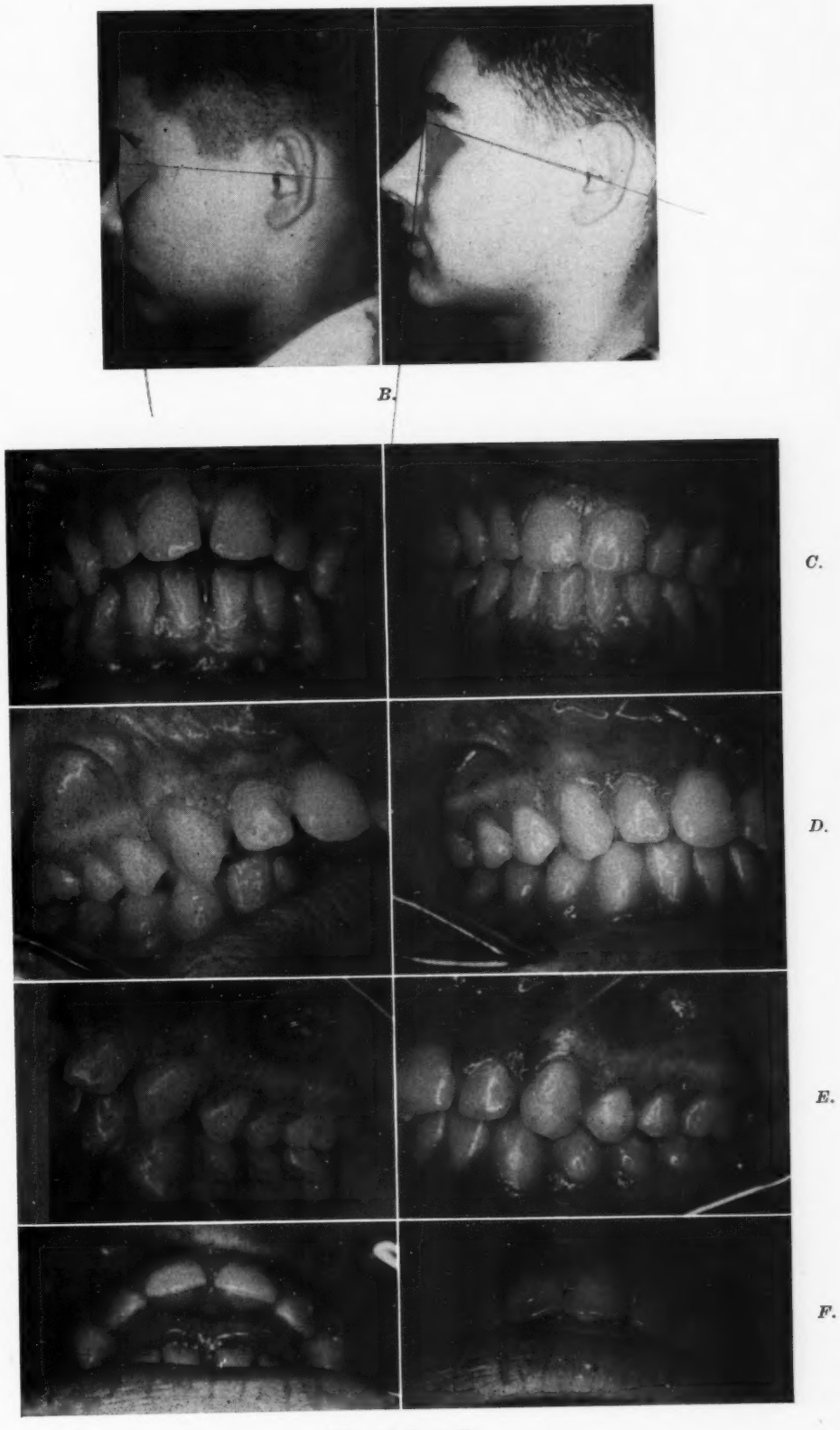


Fig. 17 *B* to *F*.

First, let us consider the morphology of this mandible. The low Frankfort-mandibular angle indicates that growth will be in a more horizontal than vertical direction. Next, we must consider the fact that in most instances adults with low Frankfort-mandibular angles have a large mandibular symphysis (the Po to NB, central incisor to NB relationship is 4.5 mm. to 3.5 mm.). This would lead us to assume that the patient will grow, as do the majority of children in this age group. Last, but not least, we must consider the low value for the Y axis. When all these favorable attributes are put together, treatment prospects appear quite bright—provided, of course, that appliance mechanics are sound—because growth is on the side of the orthodontist.

This case was treated in strict accordance with the procedure for nonextraction cases as outlined in the second part of this article. The ANB relationship was reduced to 1.3 degrees (from 6.4 degrees before treatment). This was accomplished through the medium of the torque-slot bracket mechanics coupled with high-pull headgear traction (upper central incisor to Frankfort plane, 128.5 to 118.7 degrees, or upper central incisor to NA 34.4 to 27.5 degrees [24 degrees desired by Steiner]).

Had the lower central incisor to NB and Po to NB relationship permitted us to do so and still maintain desired facial esthetics, we could have readily attained a value of 22 degrees for the central incisor to NA angle. It was more prudent in this case to individualize the denture to the patient's facial esthetics than to attain a specific angle for the upper central incisors to the NA plane.

This patient's photographs show him to be quite "chinny" (Fig. 17, *A* and *B*). The lip contours lead one to appraise this face as being "dished-in," but I want to call attention to the fact that this is a nonextraction case. The "dishing-in" is very likely due to three factors: (1) a large symphysis, (2) recontouring the anterior part of the maxilla by carrying point A back, and (3) a rather large nose.

Examining the denture, we find normal cuspal and inclined-plane interdigitation. We also observe an overbite and overjet which complement the cants of the inclined planes of the posterior teeth. All these factors together spell out continuous self-equilibration and denture stability. This patient wore a Hawley type of retainer for three weeks. Fig. 17, *C* to *F* shows what the denture looked like at the end of that time.

CASE 4.—This patient was a boy, aged 11 years, 2 months, who had a Class I malocclusion in which no extractions were required.

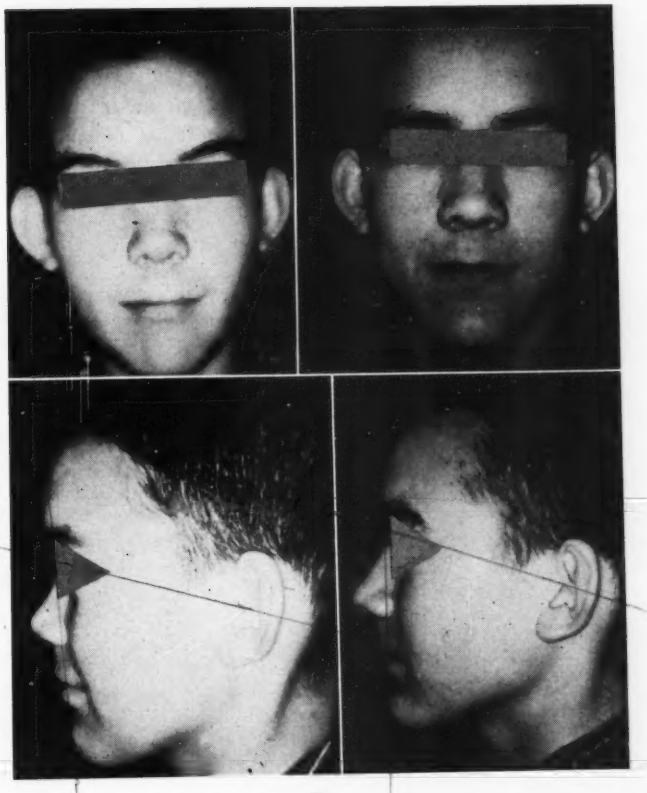
Although the values for the denture bases fall somewhat short of the mean (SNA 78 degrees, SNB 76.5 degrees), the remaining cephalometric data indicate a good growth pattern (Table IV). Facial photographs, like the cephalometric data, reveal a good skeletal pattern with a very well-developed symphysis for this age (Fig. 18, *A* and *B*).

In this malocclusion the anterior teeth are in overbite and are rotated.

TABLE IV. CASE 4

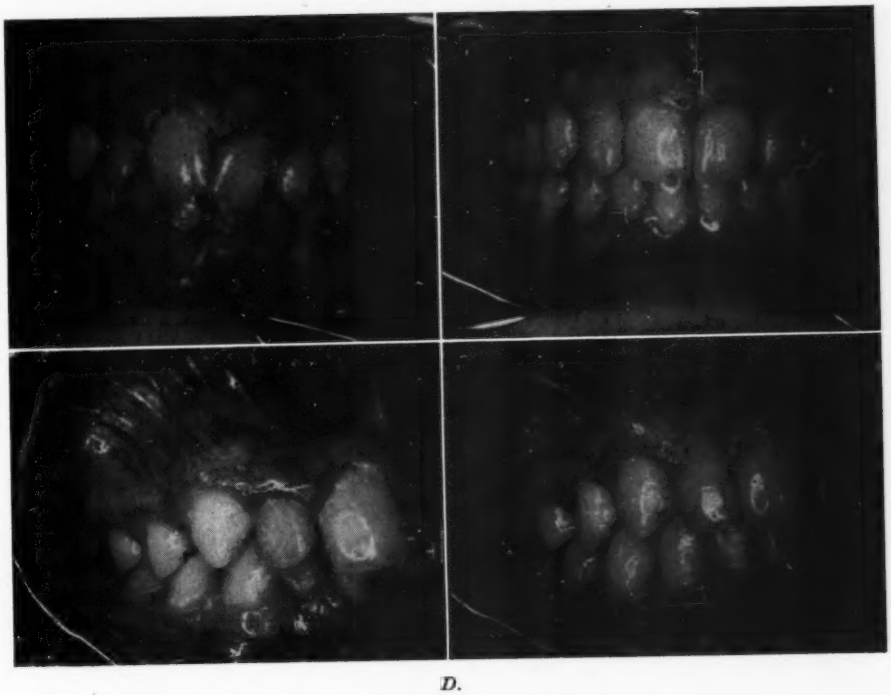
ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	78°	76°	82.01°
2. SNB	76.5°	75°	79.97°
3. ANB	1.5°	1°	2.04°
4. FMA	25.5°	25°	25°
5. IMPA	91.5°	90°	90°
6. FMIA	63°	65°	65°
7. Occlusal plane	10°	8.5°	9.3°
8. Central incisor to A-Po	1.5 mm.	2 mm.	0
9. Central incisor to NB (mm.)	2.5 mm.	2.5 mm.	4 mm.
Po to NB	3.5 mm.	5.5 mm.	
10. Central incisor to NB (angular)	20.5°	17°	25°
11. Y Axis—linear (growth)	122 mm.	133 mm.	
12. Y Axis—angular (axial relation)	59°	58°	
13. Upper central incisor to Frankfort plane	117°	111°	
14. Upper central incisor to NA (angular)	24°	23°	
15. Upper central incisor to NA (mm.)	4.5 mm.	4.0 mm.	4 mm.

A.



B.

C.

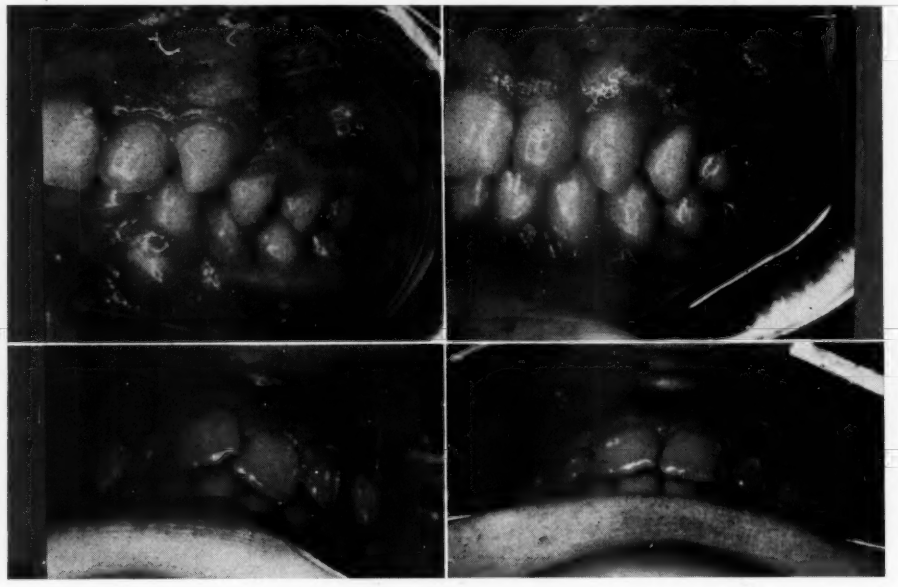


D.

Fig. 18 *A* to *D*.

The most significant thing that can occur during treatment—growth—cannot be attributed to mechanics. This patient grew beyond expectation in the region of the symphysis (central incisor to NB, Po to NB ratio, 2.5 mm.:3.5 mm. before treatment to 2.5 mm.:5.5 mm. after treatment), as shown in Table IV and Fig. 18, *A* and *B*. The treated denture, like the previous one, is well oriented to cranial anatomy and, in addition, it is also beginning to equilibrate itself. Because of this equilibration, the retention period will probably be a short one (Fig. 18, *A* to *F*).

E.



F.

Fig. 18 *E* and *F*.

CASE 5.—A girl, aged 10 years, 9 months, had a Class II, Division 1 molar relationship. Four first premolars were extracted.

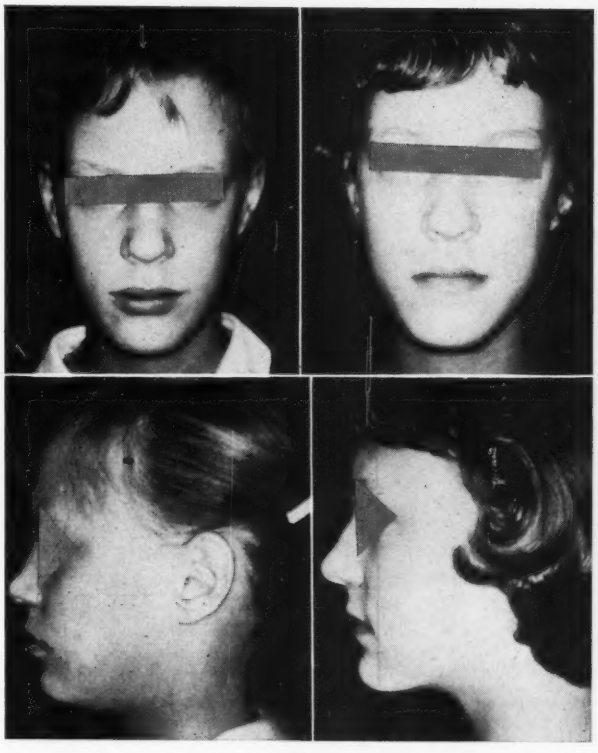
Although this malocclusion is similar to the one described in Case 1, here the skeletal pattern is somewhat different. The value for the Frankfort-mandibular plane is low (Table

TABLE V. CASE 5

ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	78.6°	76.4°	82.01°
2. SNB	75.0°	16.0°	79.97°
3. ANB	3.6°	.4°	2.04°
4. FMA	20.0°	20.0°	25°
5. IMPA	89.6°	87.1°	90°
6. FMIA	10.0°	12.6°	65°
7. Occlusal plane	5.0°	6.7°	9.3°
8. Central incisor to A-Po	–1 mm.	–1.5 mm.	0
9. Central incisor to NB (mm.)	3 mm.	2 mm.	4 mm.
Po to NB	2.5 mm. (3:2.5)	5.5 mm. (2:5.5)	
10. Central incisor to NB (angular)	18.4°	15.4°	25°
11. Y Axis—linear (growth)	126 mm.	134 mm.	
12. Y Axis—angular (axial relation)	55.4°	55.4°	
13. Upper central incisor to Frankfort plane	121.0°	109.8°	
14. Upper central incisor to NA (angular)	30.5°	21.5°	22°
15. Upper central incisor to NA (mm.)	8 mm.	4.5 mm.	4 mm.

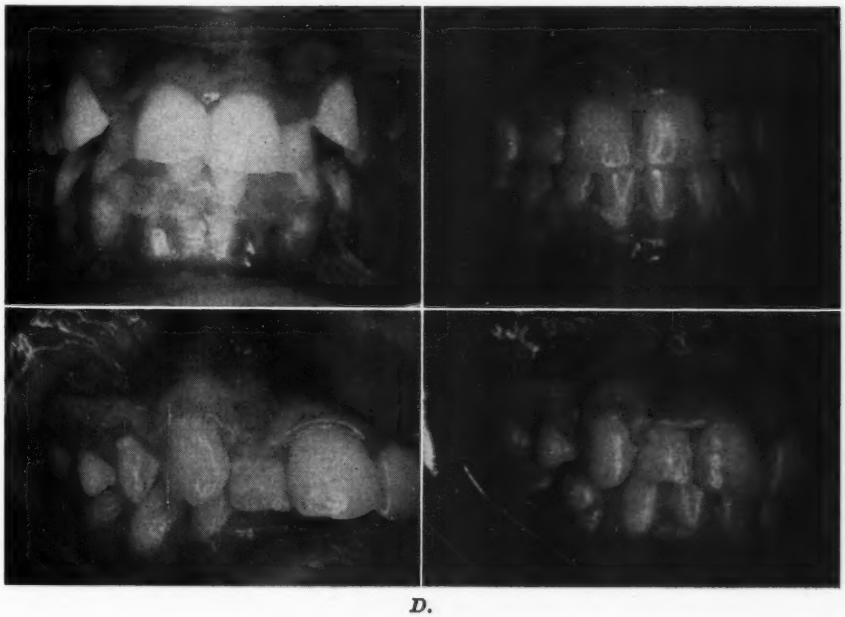
V). The lower incisors overlie the apical base (IMPA, 89.6 degrees). The upper central incisors are in moderate protrusion. In addition to these, there is a well-developed symphysis (Fig. 19, *A* and *B*).

A.



B.

C.

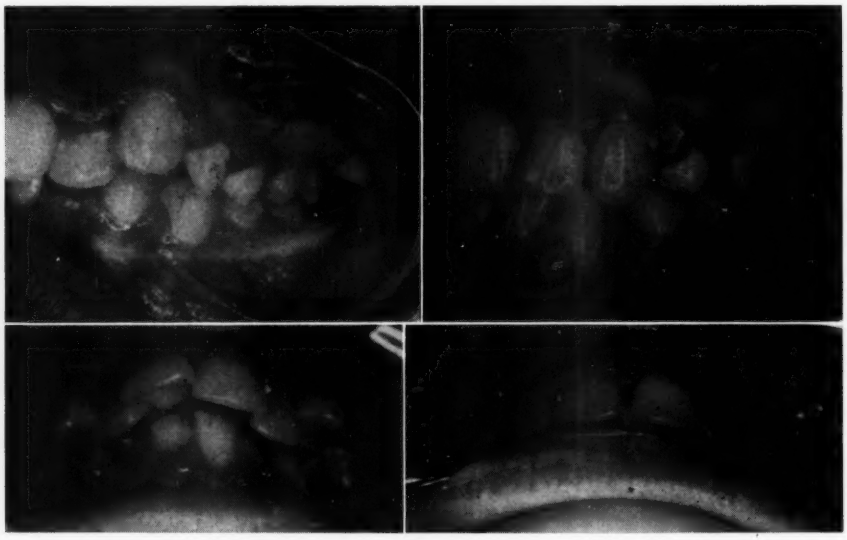


D.

Fig. 19 *A* to *D*.

Although this is identified as a Class II malocclusion by molar relationships, it is actually a malocclusion due to discrepancy between tooth material and apical base and mesial migration of buccal segments. In this instance the discrepancy is greater in the upper arch than in the lower arch (9 mm. upper, 7 mm. lower) (Fig. 19, *C* to *F*, before treatment).

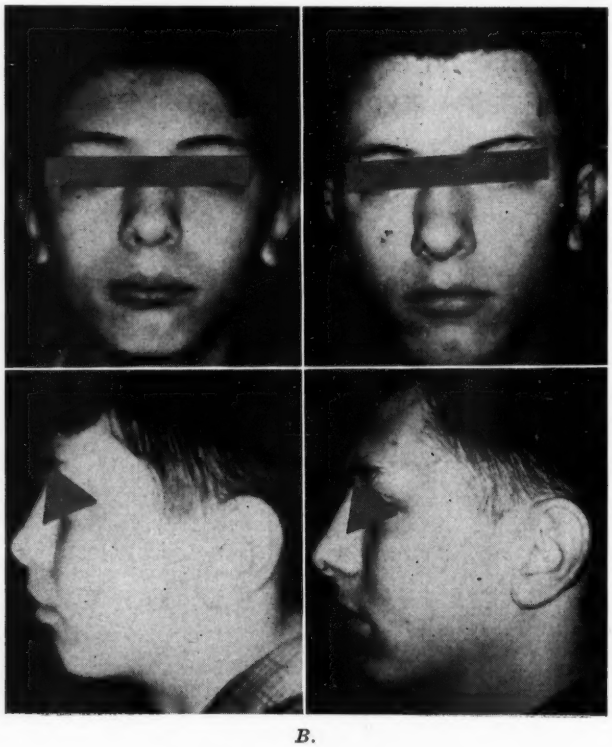
E.



F.

Fig. 19 *E* and *F*.

A.



B.

Fig. 20 *A* and *B*.

The after-treatment facial photographs reveal some increase in growth of the mandibular symphysis (Fig. 19, *A* and *B*). This is verified in the posttreatment cephalometric record (Table V, central incisor to NB and Po to NB ratio, 3:2.5 before treatment to 2:5.5 after treatment).

This denture began to equilibrate during treatment (Fig. 19, *C* to *F*, after treatment) and is continuing to do so in retention. A Hawley plane is worn on the maxillary teeth two nights a week. The lower teeth are not being retained.

CASE 6.—The patient was a boy, aged 11 years, 1 month, with a Class I malocclusion. The dental irregularities were due to a discrepancy between arch length and tooth size.

There was a 9 mm. arch length deficiency in the lower arch, and an 8 mm. deficiency in the upper arch. Anchorage was prepared by distal tipping of the teeth in the resistance unit with angulated brackets and very light resilient forces augmented by elastics. A two-strand Fogel bundle arch was used for the first stage of uprighting the lower posterior teeth. This was replaced by an 0.016 and an 0.018 inch arch. Neither headgear nor Class III elastics were worn during canine retraction, arch consolidations, or molar uprighting and distal tipping. The patient's skeletal pattern is about the same as that of the patient in Case 5 (Fig. 20, *A* and *B* before treatment), but the dental pattern is somewhat different. The upper and lower anterior teeth are quite procumbent (Fig. 20, *C* to *E*). The large ANB difference is due mainly to a retrusive mandible which makes this face noticeably backward divergent (Table VI).

TABLE VI. CASE 6

ANGLE OR PLANE MEASURED	BEFORE TREATMENT	AFTER TREATMENT	STANDARDS MEAN
1. SNA	76°	74°	82.01°
2. SNB	69.5°	71.5°	79.97°
3. ANB	6.5°	2.5°	2.04°
4. FMA	32.5°	32.0°	25°
5. IMPA	101.0°	92.5°	90°
6. FMIA	46.5°	56.0°	65°
7. Occlusal plane	12.0°	12.5°	9.3°
8. Central incisor to A-Po	2 mm.	0	0
9. Central incisor to NB (mm.)	7 mm.	4.5 mm.	4 mm.
Po to NB	2.5 mm.	4.0 mm.	
10. Central incisor to NB (angular)	29.0°	24.5°	25°
11. Y Axis—linear (growth)	119 mm.	126 mm.	
12. Y Axis—angular (axial relation)	71.0°	69.0°	
13. Upper central incisor to Frankfort plane	111.0°	101.0°	
14. Upper central incisor to NA (angular)	31.0°	23.0°	22°
15. Upper central incisor to NA (mm.)	8 mm.	3 mm.	4 mm.

Four premolars were extracted to facilitate placement of the anterior teeth over their respective apical bases. The posttreatment cephalometric record reveals that the patient had a good growth period during treatment (7 mm. growth on the Y axis). During this growth spurt the symphysis increased considerably. Growth in the mandible, coupled with an appreciable reduction in the ANB difference, changed this patient's facial configuration markedly.

The soft-tissue draperies about the denture are no longer tense, even though the lower incisors are somewhat procumbent for the high Frankfort-mandibular angle (92 degree IMPA for a 32 degree FMA) (Fig. 20, both points *A* and *B* changed). The repositioning of lower anterior teeth over apical base and the distal movement of point B with relation to the body of the mandible advanced the symphysis (Po). This recontoured the lower part of the face, giving it a more pleasing appearance.

At about the time that we began to approach a normal inclined-plane relationship, these teeth began to show signs of self-equilibration which has since continued. This denture, mounted on the hinge-axis registration, shows no prematurities on any of the inclined

planes for any functional movements. After the appliances had been removed, this denture was not retained. Six months have elapsed since removal of appliances, and the denture continues to remain stable (Fig. 20, *C* to *F*, after treatment).

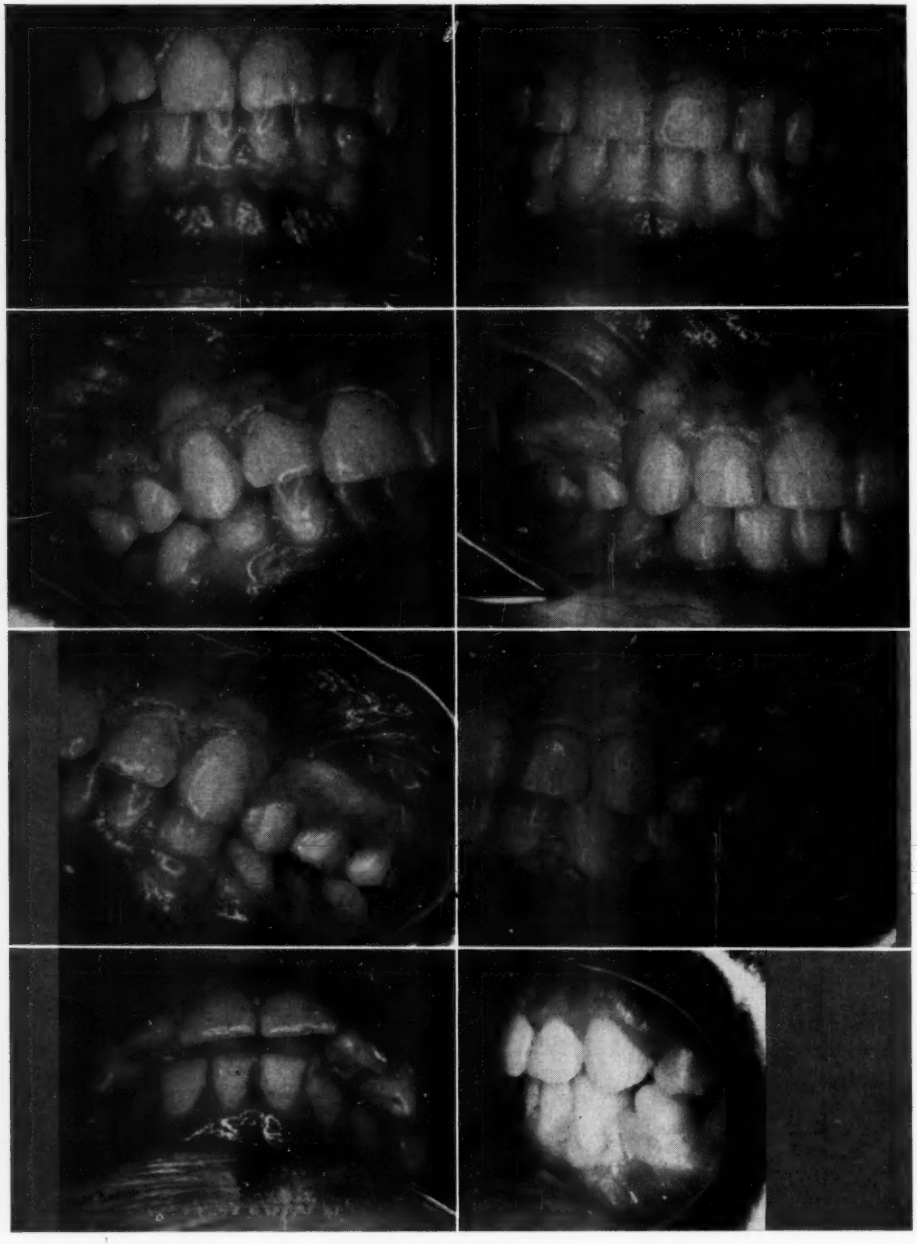


Fig. 20 *C* to *F*.

CONCLUSION

Light continuous forces derived from high-resiliency wires have been adapted to the Tweed principles. A light continuous force regulates teeth

faster and with less destruction of tooth substance and less pain to the patient than an intermittent force derived from less resilient rectangular wires. Since the majority of tooth movements are achieved with first- and second-order mechanics, it is more efficient to obtain these from light resilient wires engaged in angulated brackets.

We do not try to eliminate rectangular wires from our mechanics. Rectangular wires are used when torque forces are needed to retract upper anterior teeth bodily and to obtain the correct labiolingual axial inclination of posterior teeth. Rectangular wires are also used to gain ideal arch form, which is difficult to obtain with light resilient arches. Since third-order mechanics (torque) are usually of a lesser magnitude than those of the first and second orders, there is considerably less damage to the root surface when the first- and second-order mechanics are carried out with light resilient wires than when all three orders of mechanics are handled with intermittent forces derived from rectangular wires of low resiliency.

Sound mechanics will go a long way toward helping us realize our objectives of facial esthetics, functional harmony, and denture stability.

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EXPANSION AS A TREATMENT PROCEDURE—WHERE DOES IT STAND TODAY?

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THE word "expansion," as used in the title of this article, refers to lateral enlargement of the dental arches by orthodontic forces, which can be either direct or indirect. The direct forces are those exerted against the teeth to move them in a buccal direction, and the indirect forces are those which, through the pull of the interseptal fibers, cause the premolars and cuspids to assume a position in a wider part of the arch. Extraoral retraction of the maxillary first molars is such a force.

In this country the status of expansion of the dental arches as a treatment procedure has changed greatly in the past fifteen years. More than 200 years ago insufficient arch width was recognized as the principle cause of irregular, crowded teeth, and the band or bandalette described by Fauchard, was the first true orthodontic appliance used in attempts to correct this deformity.

This later became the expansion arch of Angle, and the terms "orthodontia" and "arch expansion" were practically synonymous. Now, however, many orthodontists say that they have discarded expansion as a part of orthodontic therapy. In the indexes of most of our latest textbooks even the word itself has been totally ignored, and if one searches under the prefix "ex," he will find that there is not even a blank line to grace its memory in the place where it belongs alphabetically, between the words "examination" and "extraction."

Thus, the new approach was born. Growth, once lost, can never be regained. Arch form cannot be changed. Extraction is obligatory in a very high percentage of cases if treatment objectives are to be obtained.

The postgraduate schools, whose influence on orthodontic thinking and procedures is growing tremendously, taught the new approach and ways to get the best results with it, and the young men entering the specialty thought less and less about the possibilities of expansion.

It is very easy to understand the reason for the change. Anyone who has been in practice in one community long enough to see many of his former patients years after treatment expects to see irregularities in their mandibular incisors. This is particularly true if the arches were expanded or if intermaxillary elastics were used in treatment. I, for one, was about ready to "throw in the sponge" on expansion. I did not do so, however, for at about that

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time I started to use extra force routinely on all Class I and Class II cases, and I wondered whether lateral enlargement of the coronal arches had been given a really fair trial—not as a panacea, as it was used originally, but in selected cases in the mixed dentition while the mandibular first molars were in their most distal positions, since at this time the mandibular arch, from the distal surface of the first molars forward, is longer than at any future time in life.

Undoubtedly, one of the principal reasons for the collapse following some of our early expansions was inadequate basal bone for the existing amount of tooth material. Teeth should never be tipped buccally or labially beyond the limits of their normal relationship with supporting bone. Relapse is almost inevitable. Of course, it is understood that muscular balance produces this relapse; the muscles are attached to the bone, however, so that basal arch size

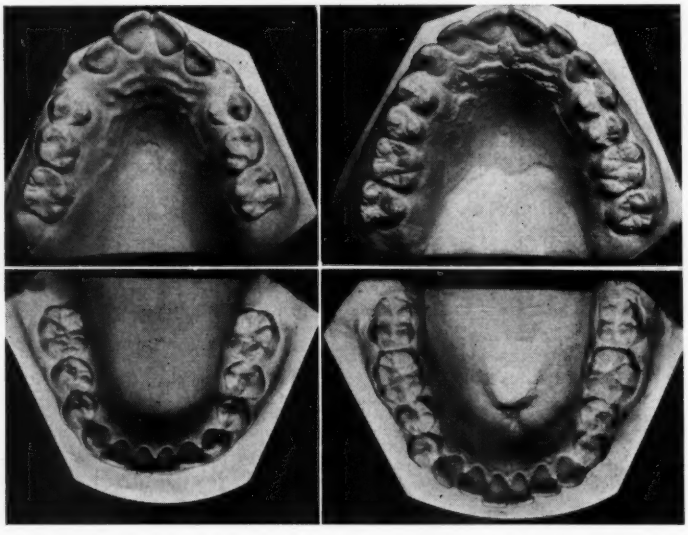

Fig. 1.—Example of arch expansion accompanied by arch foreshortening. Crowding of anterior teeth is due more to loss of arch length than to loss of arch width. (From Howes: Am. J. Orthodontics, January, 1957.)

and muscular balance are intimately related. Salzmann,[1] in his book entitled *Orthodontics, Principles and Prevention,* has described the closed functional system of the jaws which governs the ultimate positions of the teeth. He says: "This closed functional arrangement limits the area in which the orthodontist can place the teeth in his attempts to eliminate malocclusion. Mershon long ago recognized these limitations when he said 'We can put the teeth where we think they belong, but nature [function] will eventually place them where they actually belong.'"

There were other factors which magnified the extent of the collapse. Expansion was generally done after the permanent side teeth had erupted. The alveolar process was formed and therefore was not as susceptible to possible molding as it is when treatment is started in the mixed dentition and carried through the period of eruption of the permanent side teeth. Furthermore, insufficient attention was given to maintaining arch length. The natural tendency

is for an arch to foreshorten; to aggravate this, strong intermaxillary force was often employed against the mandibular molars. Thus, when the arch was expanded, it generally foreshortened, and for every millimeter that the molars moved forward, there had to be 2 mm. of expansion even to maintain the status quo for the crowded teeth. Needless to say, as the mandibular anterior teeth recovered from the forward tipping to which they were generally subjected, the crowding was worse than the original condition, even though some of the expansion was maintained (Fig. 1).

The term "arch length" as used in this and previous articles, refers to the midline length of the basal arch, from the distal aspect of the first molars to the most anterior point of the basal arch. This is point "A" in the maxillary arch and point "B" in the mandibular arch. This differs from the concept of "arch length" as it is often used today in orthodontics to signify the total mesiodistal space that exists for the teeth, generally from the mesial surface of the first molar on one side to the mesial surface of the first molar on the other. This is a circumferential or perimeter measurement and, in my opinion, is a confusing and misleading term. If the teeth are crowded or blocked out of the arch, the arch is described as being deficient in arch length. Most of the time the crowding of the teeth, particularly in a mixed dentition, is due to inadequate arch width and not to a foreshortening of the arch, as the expression "deficient arch length" would imply. In engineering, the length or height of an arch refers to the distance from the base of the arch to its vertex. The measurement is taken at the midline.

I realize that it is incorrect to divide the members of our speciality according to those who believe in expansion and those who do not, for most of us believe in expanding an arch that is in linguoversion, whether it is a maxillary or a mandibular arch.

In the two cases illustrated in Figs. 2 and 3, I would expect almost complete agreement on the treatment attempted, although perhaps not on the results obtained. It is not these cases but the Class I or Class II cases, in which both arches are constricted, that produce the differences of opinion concerning treatment procedures.

When an orthodontist says that he does not expand arches in his treatments, he generally means that he does not believe in trying to increase mandibular intercanine width by expansion. Strang[2] has defined this position very clearly in his axiom of mandibular canine width: "The width, as measured across from one canine to the other, in the mandibular denture, is an accurate index to the muscular balance inherent to the individual, and dictates the limit of expansion in this area of treatment."

Strang goes on to say that this mandibular canine width must not be increased, or relapse will occur, but that if the canine teeth are moved distally following premolar extractions they can be moved buccally to the limits offered by the newly acquired distal locations.

Opposed to this concept is the mute evidence of thousands of jackscrews, sliding devices, split plates, and lingual arches, with loops or auxiliary springs, etc., which are used by those who still believe in widening the dental arches.

The European orthodontists whose articles I have read and those with whom I have talked seem to regard large amounts of expansion in treatment as routine.

I believe that Crozat and his disciples often use considerable expansion in their treatment.

In 1953 Walter[3] reported on the results obtained when he measured the casts of 102 persons who had undergone orthodontic treatment.

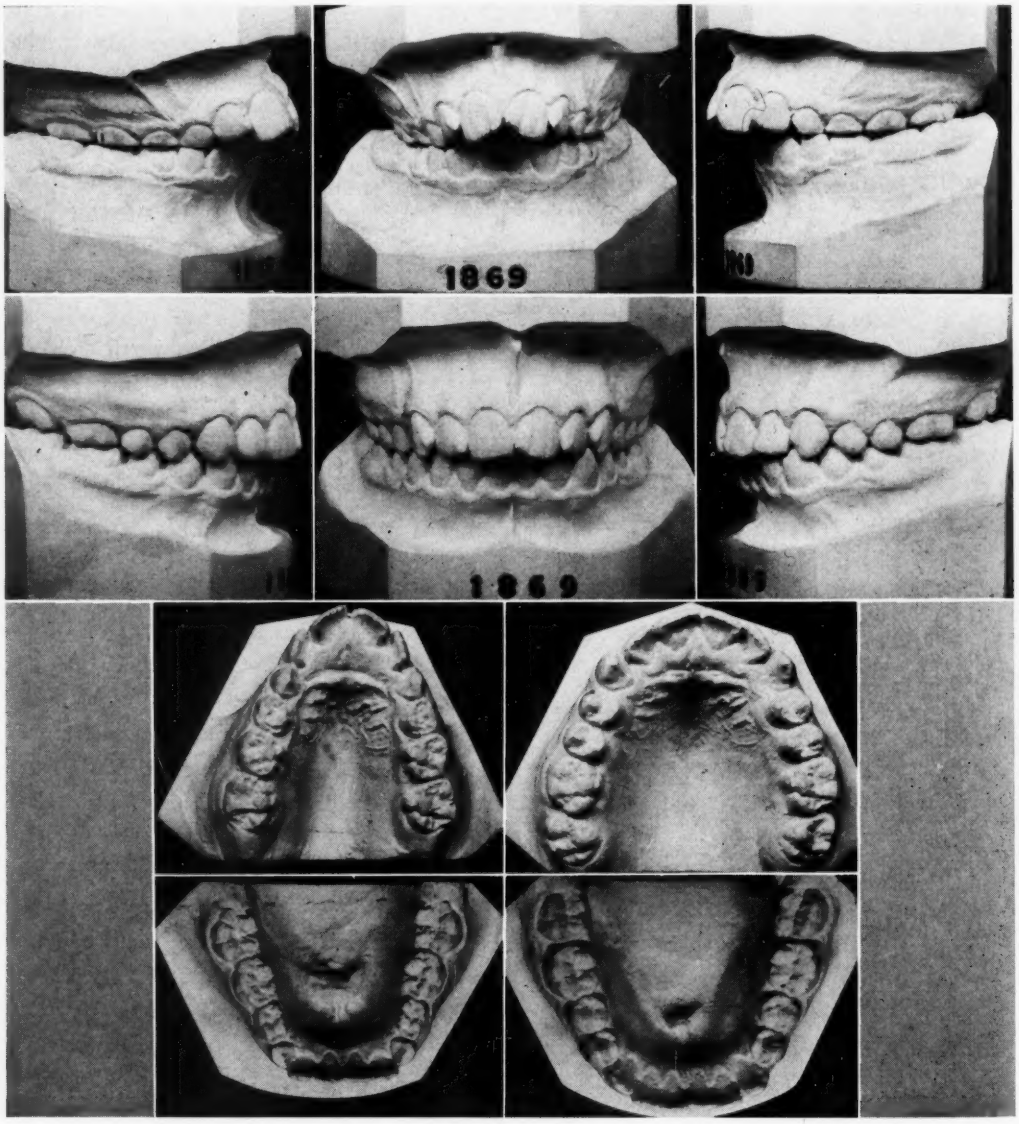

Fig. 2.—Case 1869. Maxillary arch in linguoversion, which was expanded over 10 mm. and remained that way. (From Howes: AM. J. ORTHODONTICS, January, 1957.)

In cases in which expansion had been attempted he found that some of the arches remained the same, some suffered relapse, and some became even larger years after treatment. A summary of the various measurements that he made,

many of them years after removal of retention, led him to the following conclusion: "The findings of this investigation seem to indicate that the statement that the dental arch cannot be permanently widened, or lengthened, is incorrect." Walter was using Nance's interpretation of the term "arch length," that is, a perimeter measurement.*

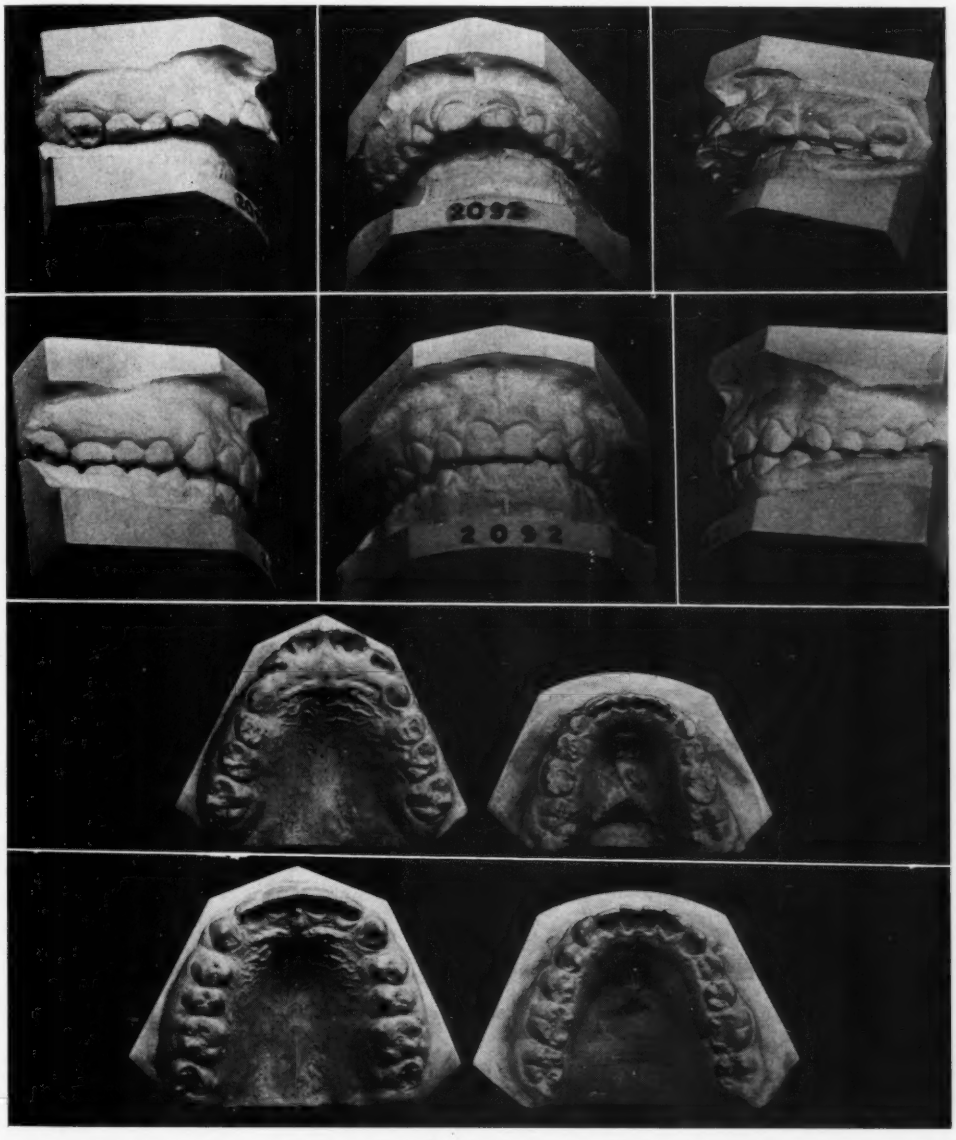

Fig. 3.—Case 2092. Extreme Class II malocclusion, with mandibular arch in complete linguoversion. A large amount of expansion of the mandibular arch plus forward growth, or a repositioning of the mandible, corrected the buccolingual relationship.

*I wrote to Dr. Walter and asked if he had some second thoughts on expansion, and I quote his answer in part: "I believe too many orthodontists, after studying a prospective patient's records and models, lose sight of the patient's full potential growth. An examination of the patient's denture and the static models seems to blind them to the fact that during the growing years the full potential growth, in many cases, can be hopefully anticipated. In Class II, Division 1 cases, the use of a headcap will hold back the molar segment of the maxilla until the mandible grows downward and forward into a Class I position. With this simple treatment, I have seen both upper and lower arches rounded and widened to an amazing degree. This type of treatment is not for the orthodontists who wish quick results."

If we confine our attention to that critical area of the mandibular arch, which is anterior to the first permanent molars, if we exclude those cases with lingually inclined teeth (the basal arches are always larger than the coronal arches when the teeth are inclined lingually), and if we exclude certain cases in which patients have extremely long arches, most of the evidence that I have would support Strang's axiom.

For a long time now, I have believed that little, if any, lateral change can be made in the basal arches anterior to the first molars. I further believe that if expansion is attempted the buccal teeth should not be tipped outside the limits of the basal arches. This does not imply that the intercanine width of the permanent teeth cannot be greater than the intercanine width of the deciduous cuspids. When the mandibular first premolars are extracted, the intercanine distance can be increased by moving the cuspids back into a wider part of the arch. The same condition can be brought about without extractions when the arch is expanded in the area of the deciduous molar and first permanent molar. This is true only in certain cases which will be taken up later.

Fig. 4.—Case 2041. In this case the second deciduous molars were extracted prematurely, and the second premolars are trapped below the level of occlusion. An attempt was made to move the molars distally, by extraoral traction only, against the mandibular molars. The anterior teeth were not used at all for anchorage. Space was created, and the premolars erupted, but later the anterior teeth corwded as the molars moved forward. Had a great deal more anteroposterior growth occurred, the result might or might not have been different.

Once the mandibular molars have moved forward from their positions in the mixed dentition, decreasing arch length, I seriously doubt that this forward movement can be reversed by orthodontic means. Figs. 4 to 7 illustrate this point.

Fig. 8, however, shows a different situation. This mandibular arch would probably be described as being deficient in arch length, since the circumferential measurement is not large enough to contain the teeth. Actually, the arch is very long, but it is so narrow that the teeth are squeezed out of alignment. In treatment, every effort was made to preserve the existing arch length, and room for the crowded mandibular incisors was obtained by moving the cuspids distally into the spaces created by expansion of the coronal arch in the molar and premolar region.

We might sum up the possibilities of expansion of the *mandibular* arch after the eruption of the permanent teeth by saying that basal arch width from the first premolars forward is not and cannot be increased. In cases in which

intercondylar width increases considerably, I think that basal arch width does increase below the molars and possibly a little bit below the second premolars. Midline arch length cannot be increased. In very long arches the molars can be expanded, and if arch length is fully maintained some space for the crowded incisors can be obtained by moving the cuspids distally.

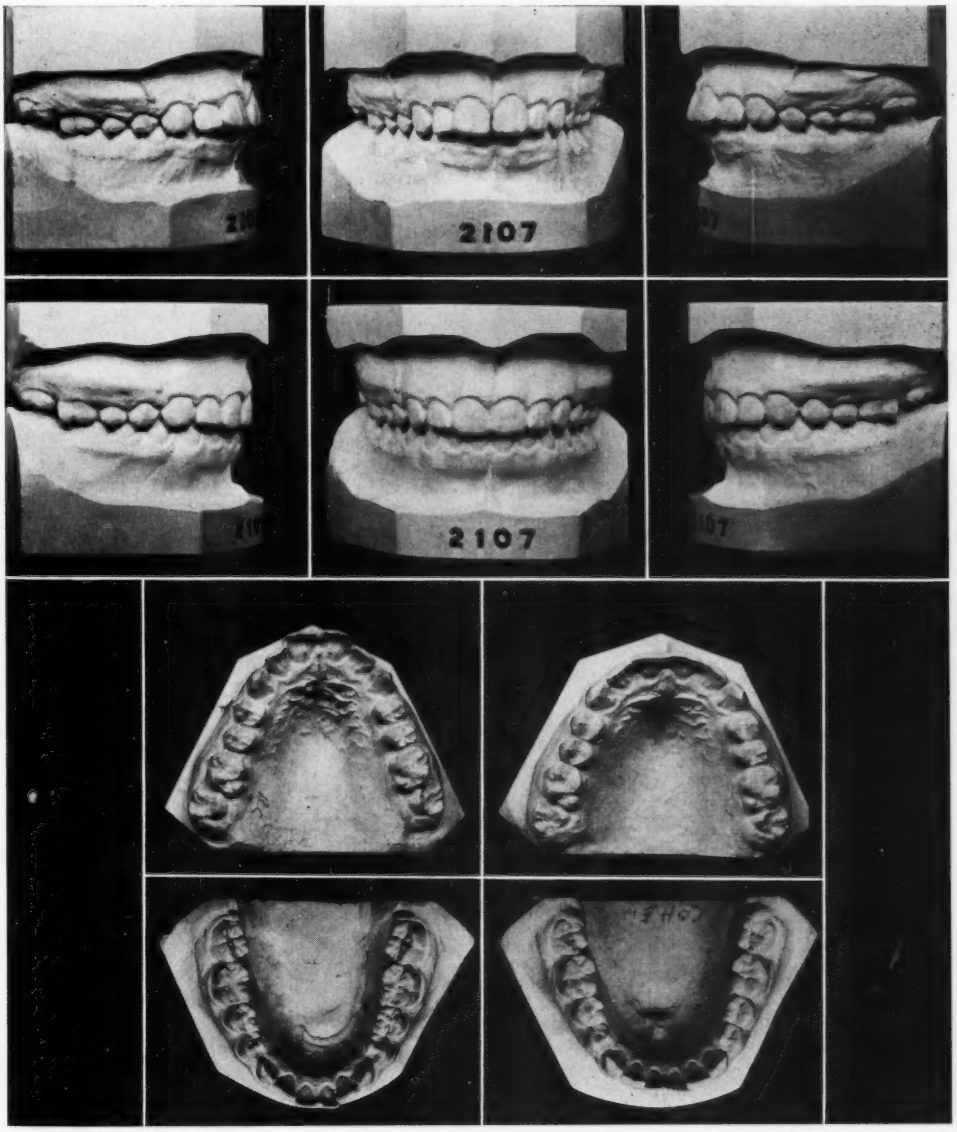

Fig. 5.—Case 2107. The four second molars were extracted, and all the teeth, maxillary and mandibular, were retracted by means of extraoral force and reverse elastics to the mandibular arch. The initial results were quite satisfactory. The coronal arches became wider as the posterior teeth moved back and the maxillary and mandibular incisors were uprighted. The four third molars erupted before the child was 13 years old.

The permanent mandibular arch should be expanded only if treatment of the maxillary arch is favorable. We often have the choice of removing four

premolars or accepting a serviceable denture with good alignment of the maxillary incisors and some irregularity of the mandibular incisors. Bimaxillary constriction of coronal and basal arches calls for the reduction of tooth material.

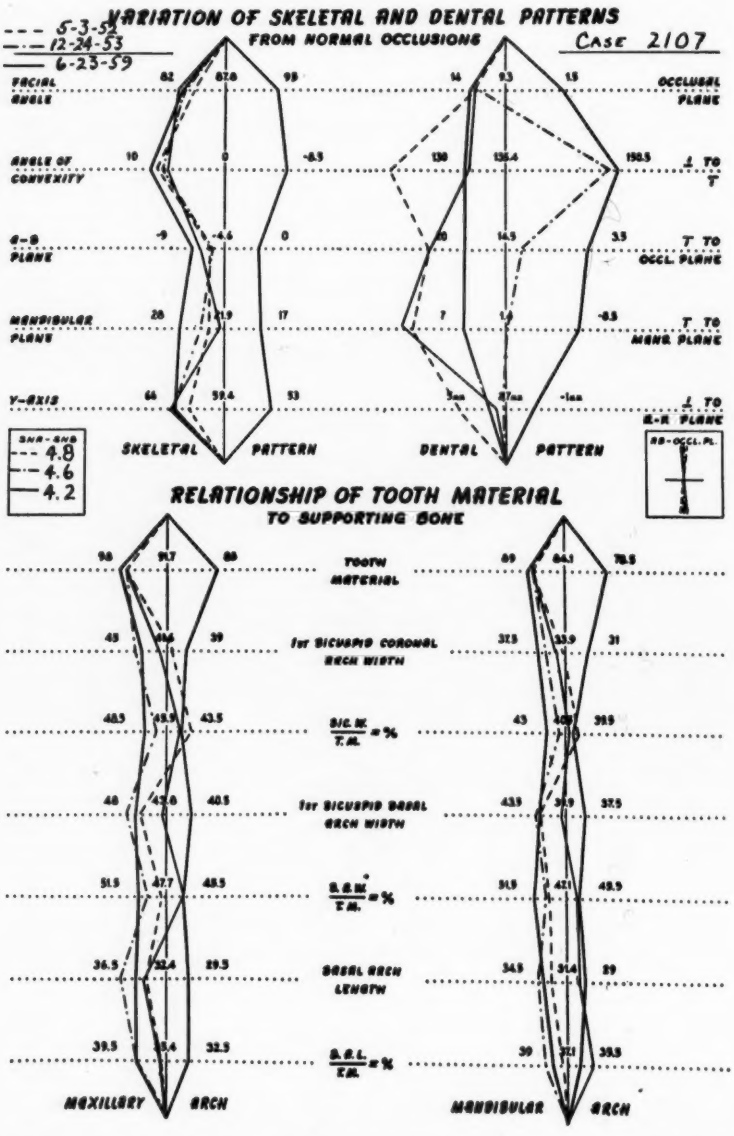

Fig. 6.—Chart showing changes produced by treatment and the relapse which followed. — — —, Original condition; — · —, after treatment; ———, final condition (following relapse).

In treatment, all first molars were moved distally, increasing arch length. Arches became wider as the side teeth assumed more distal positions in the arch. Maxillary and mandibular incisors were tipped inward, increasing the interincisal angle from 120 to 150 degrees. Post-treatment relapse at the age of 18 has been extensive. The mandibular incisors are as far forward as originally, and the arches have narrowed and foreshortened. The maxillary anterior teeth have remained retracted, since the overbite is improved.

Let us now consider the more optimistic problem of the mixed dentition. It is a well-established fact that in the mixed-dentition stage both the maxillary

and the mandibular arches, from the first molars forward, are longer than at any later time in life.

Black[4] pointed out that the average difference between the deciduous side teeth and their permanent successors is 1.7 mm. on each side. Nance[5] found that sometimes the difference was more than that, in which case the additional space could be used for the alignment of the incisors if they were somewhat crowded. Nance called this "favorable leeway space." It is interesting to note that the midline length of mixed dentitions measured in our office averages 1.7 mm. longer than that of the permanent dentitions, indicating that in changing from the mixed to the permanent dentition, the first molars move forward an average of 1.7 mm., which coincides with Black's figure for the average amount of reduction in tooth material on each side.

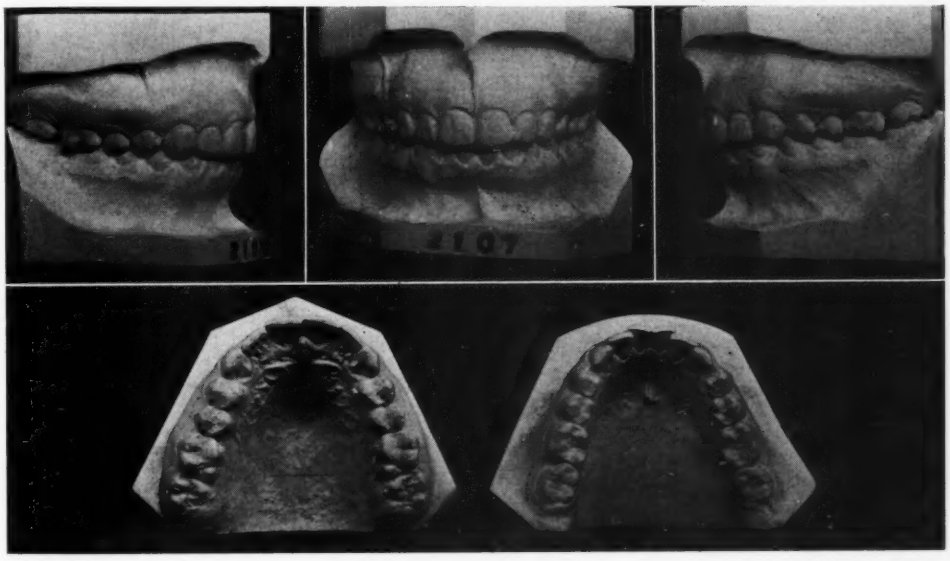

Fig. 7.—Case 2107. Casts taken when the patient was 18 years of age. Considerable relapse has taken place. The arch has narrowed, and the mandibular anterior teeth are tipped forward and are again crowded. This certainly cannot be attributed to the eruption of the third molars, and it must be due to Nature's efforts to bring the denture into harmony with its muscular environment. The same thing might have happened if four premolars had been extracted.

John Hunter observed nearly 200 years ago that, after the first year, the jaw "never after increases in length between the symphysis and the sixth tooth, and from this time, too, the alveolar process, which makes the anterior part of the arches of both jaws, never becomes a section of a larger circle." This was certainly a most cogent observation, and while there is some evidence today that the maxillary arch can be remodeled in this area at an early age, I know of no evidence that much, if any, change occurs or can be produced in the anterior curvature of the lower part of the mandibular alveolus after the fifth year.

Even if further investigation proves this assumption to be a fact, however, all attempts to increase intercanine width by orthodontic therapy are not ruled out.

Many linear and cross-sectional studies have been made of the changes in arch dimension. As far as I know, however, the measurements have been made on the teeth and not on the bone above or below the teeth. In a previous article[6] I tried to assemble, from cases treated in my office, some statistics on coronal and basal arch width in the first deciduous molar and first premolar regions.

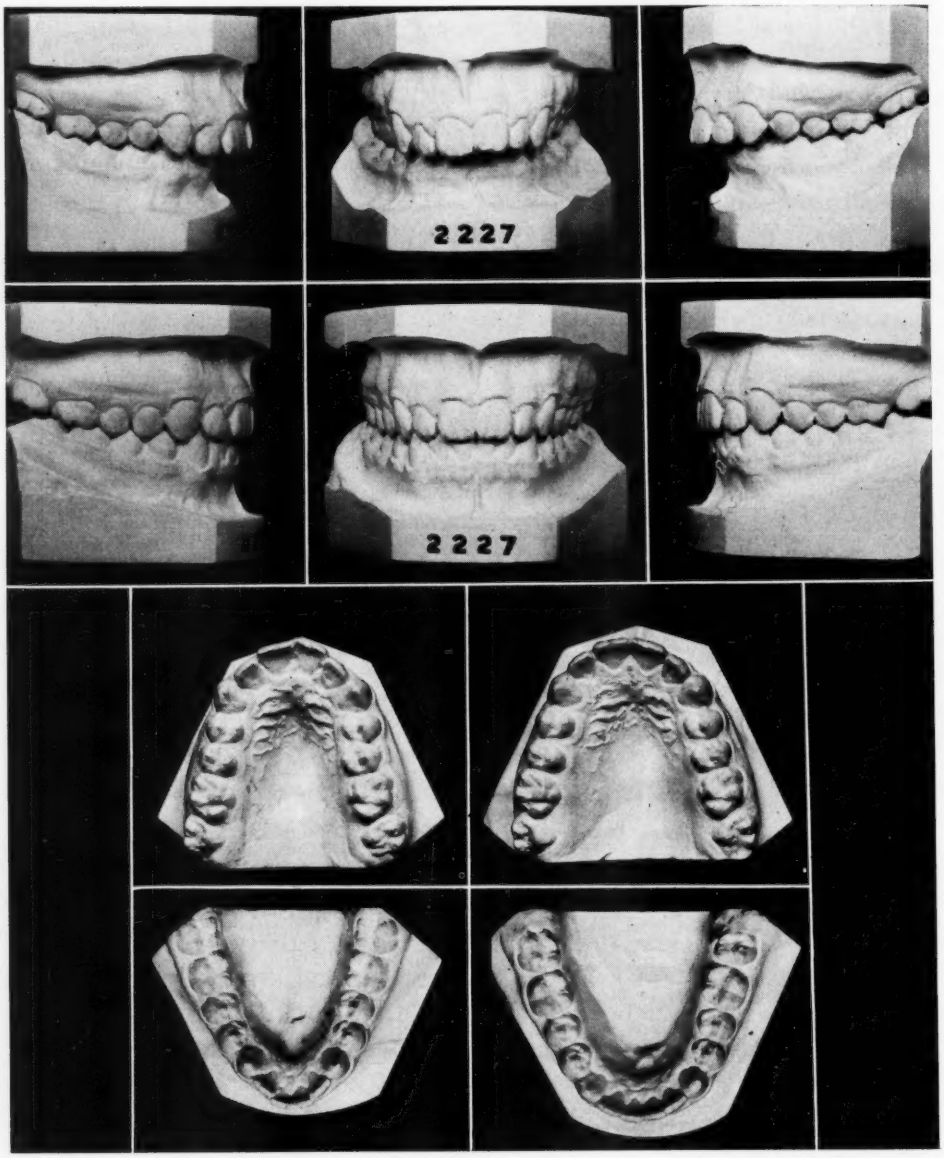

Fig. 8.—Case 2227. Note very long arches with crowded anterior teeth due to lack of arch width. Current terminology would describe this case as being deficient in "arch length"—a most misleading description.

Figs. 9 through 14 show the record of a boy over a period of twenty-three years. Fig. 9 shows the child one week after birth. He was extremely premature, and at the time this picture was taken he weighed 2 pounds. At 1 year,

he weighed 20 pounds and was 29 inches tall. He was on his way toward overcoming the physical setback inflicted by the premature birth. Fig. 10 shows him at 5 years of age. Casts of his teeth were made at that time (Fig. 11) and again

Fig. 9.—Case 1689. Premature child one week after birth. Weight, 2 pounds. Foot ruler in crib for comparison.

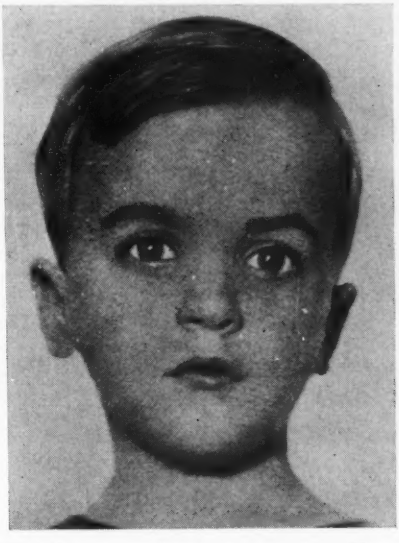

Fig. 10.—Case 1689. Photograph of patient at age 5. There is still some evidence of prematurity.

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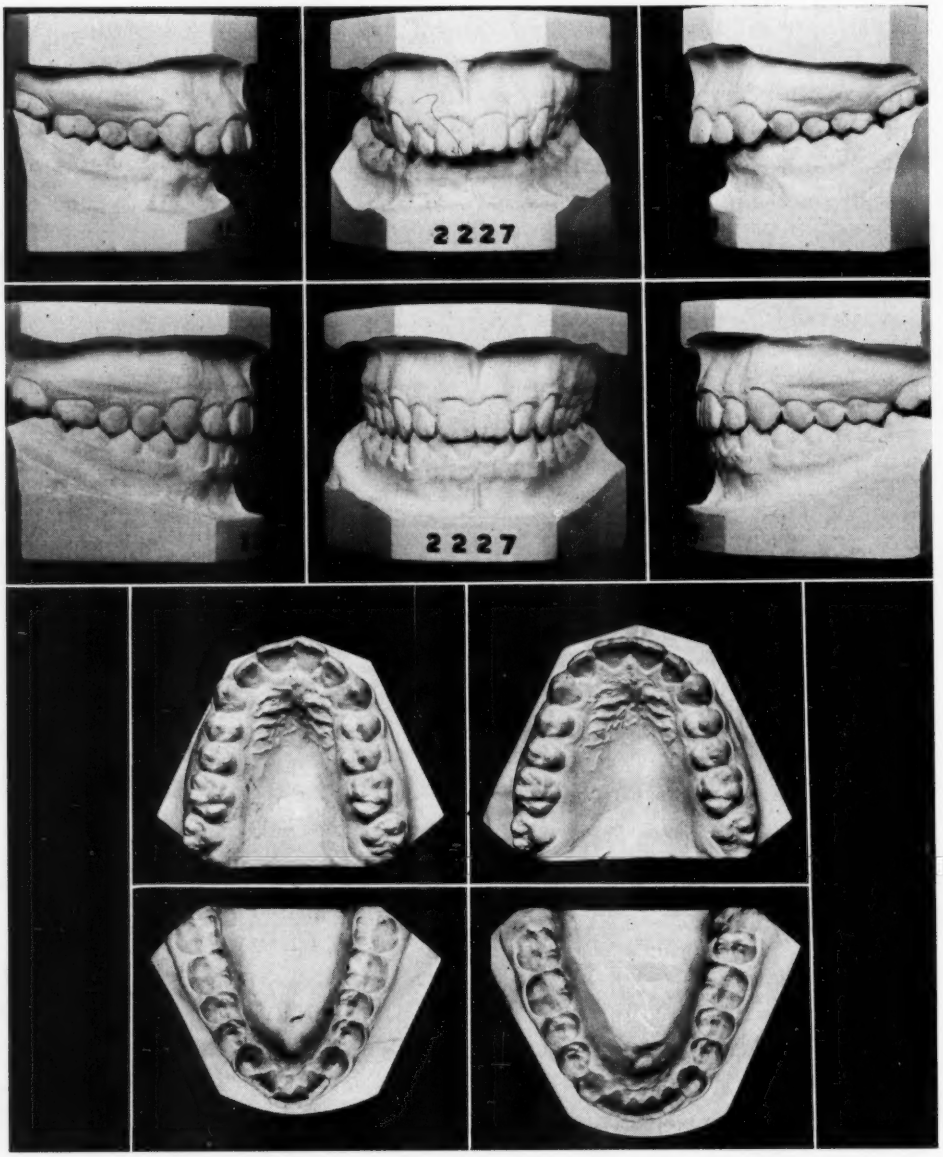

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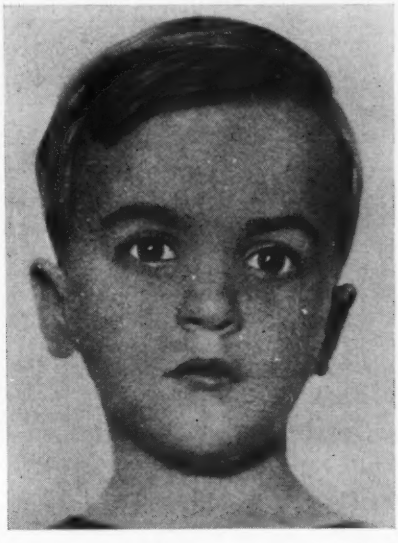

Fig. 10.—Case 1689. Photograph of patient at age 5. There is still some evidence of prematurity.

when he was 12 years old. At this time appliances were placed and worn for about one year. The treatment objective was to expand the arches and decrease the overbite. The arches were widened slightly in the molar region, and the overbite was decreased.

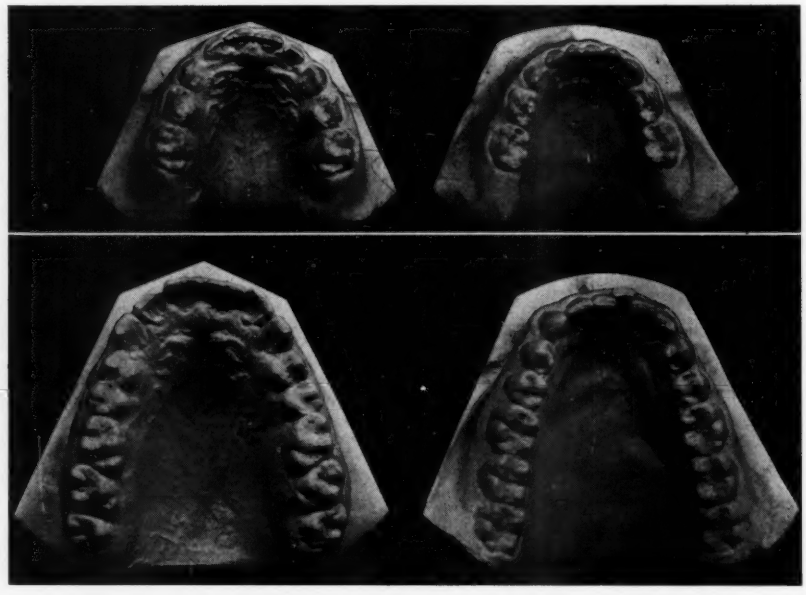

Fig. 11.—Case 1689. Casts of patient at ages 5 and 23. Deciduous teeth are very small. The mandibular central incisor is 3.5 mm. wide. The coronal mandibular arch is only 25 mm. wide across the first deciduous molars.

Fig. 12.—Case 1689. Casts taken when the boy was 12 years old.

Fig. 13 shows casts made when the patient was 23 years of age. Thirty-two teeth had erupted and were in good functional occlusion. This denture, from

prosthion to the distal aspect of the third molars, is probably longer than the whole skull was at birth. Fig. 14 shows that at the age of 23 the patient's appearance was satisfactory. He had attained a height of 6 feet 2 inches and a weight of 185 pounds.

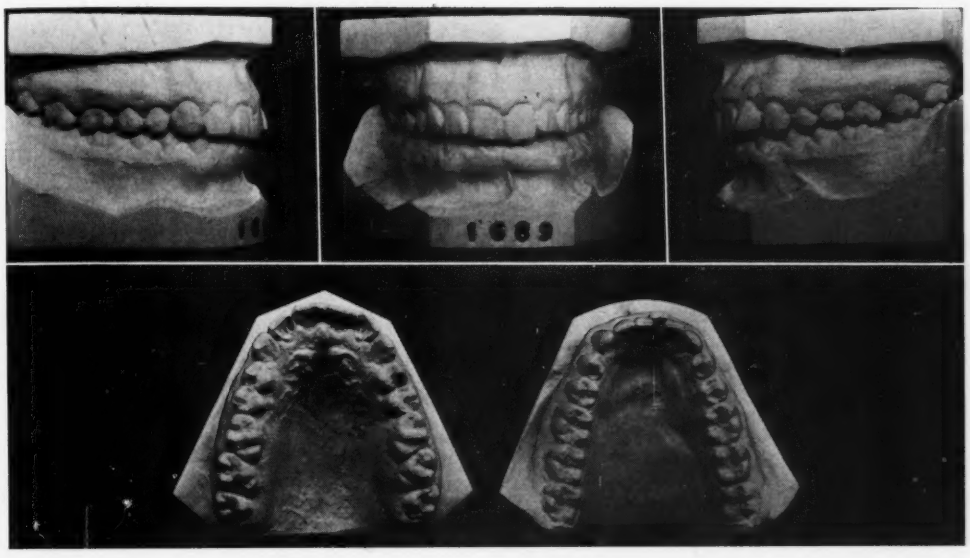

Fig. 13.—Case 1689. Casts at age 23.

Fig. 14.—Case 1689. Nonclinical photograph showing the patient at the age of 23. Height is 6 feet 2 inches, and weight is 185 pounds.

Aside from a spectacular demonstration of growth, what is there of orthodontic interest in this record? For one thing, the great amount of anteroposterior growth permitted the eruption of the second and third molars. Of

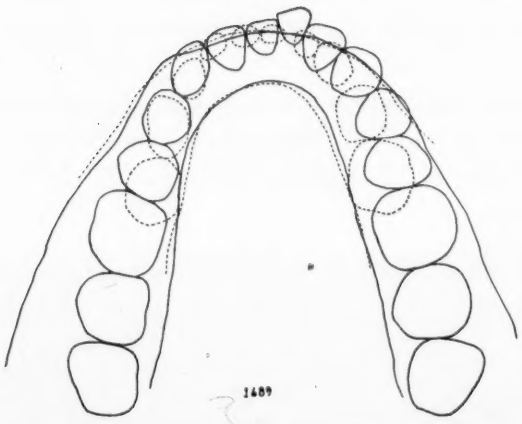

Fig. 15.—Case 1689. Composite of surveys of mandibular casts taken at ages 5 (dotted line) and 23 (solid line). Note superimposition or lack of change in labial bone outlines.

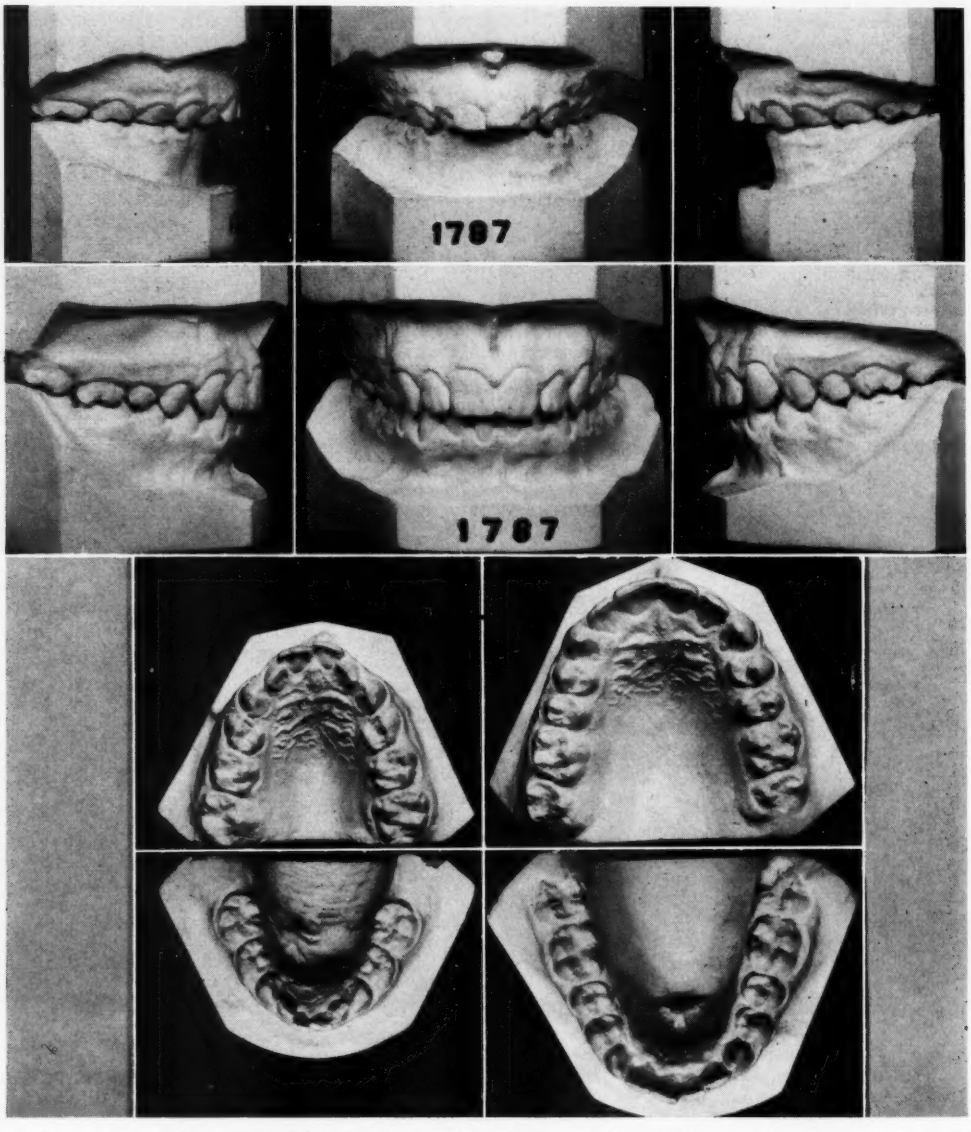

Fig. 16.—Case 1787. Coronal expansion of arches. Note crowding of deciduous incisors. (From Howes: AM. J. ORTHODONTICS, January, 1957.)

still greater interest, however, is the fact that there was little, if any, change in the alveolar arch form anterior to the first permanent molars between the ages of 5 and 23 years.

Surveys were made of the casts, and Fig. 15 shows how the mandibular arches at ages 5 and 23 compare. Superimposing the labial bone outlines, we see that the bony support of the deciduous dentition at 5 years is almost exactly the same size as the bony support of the adult arch anterior to the first permanent molars.

The intercanine width of the permanent teeth is greater than the same measurement of the deciduous teeth, since the canines have moved distally into the leeway space created by the loss of the deciduous molars. The mandibular incisors are obviously crowded.

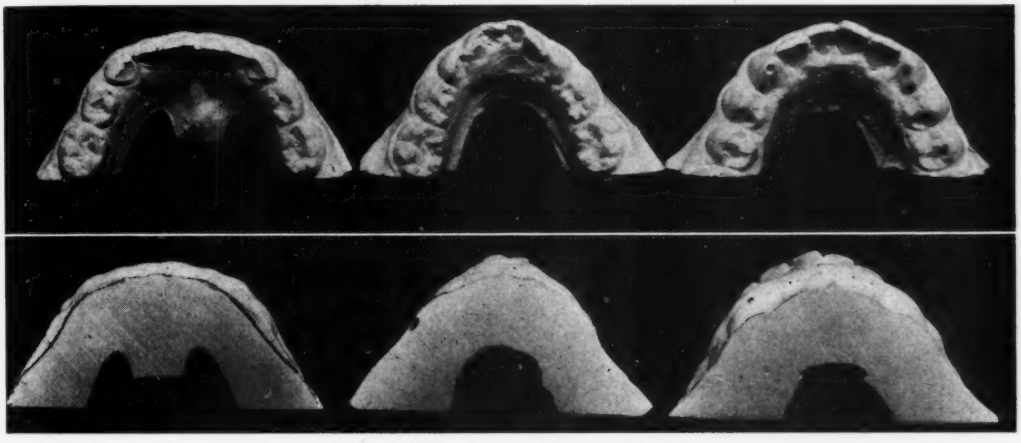

Fig. 17.—Case 1787. Mandibular basal arch outlines at ages 5 and 15 compared to each other and to normally developing dentition. (See text.)

Fig. 16 presents further evidence of our inability to enlarge the anterior curvature of the mandibular basal arch area by expansion. Over a period of time, starting with the deciduous dentition, the coronal arches were expanded a great deal. If we cut off the teeth (Fig. 17) as far down on the anatomic portion of the casts as possible, however, and then turn the casts over (the casts in the center and on the right), no difference in the arch form or size is found although there is about a ten-year difference in age. The space for the anterior teeth has been created by widening the coronal arch and allowing the cuspids to erupt in more distal positions. For comparison, the third cast (the one on the left) shows a normal dentition with the mandibular central incisors just erupted. Notice the much greater coronal arch width of this cast as compared with that of the treated case. The outline of the basal arch of the extremely narrow case has been traced onto the normal case to show just how much difference there is in the basal arches.

Here can be seen the difference between the width of the supporting bone in the cuspid and first premolar area in a case with evenly aligned incisors and in one with very crowded deciduous incisors. The difference seems very small, but it is extremely important for, if it cannot be enlarged by treatment, when

it is deficient there are bound to be either crowded or labially inclined incisors in the finished result. Some irregularity is certain to develop in the incisors of this treated case.*

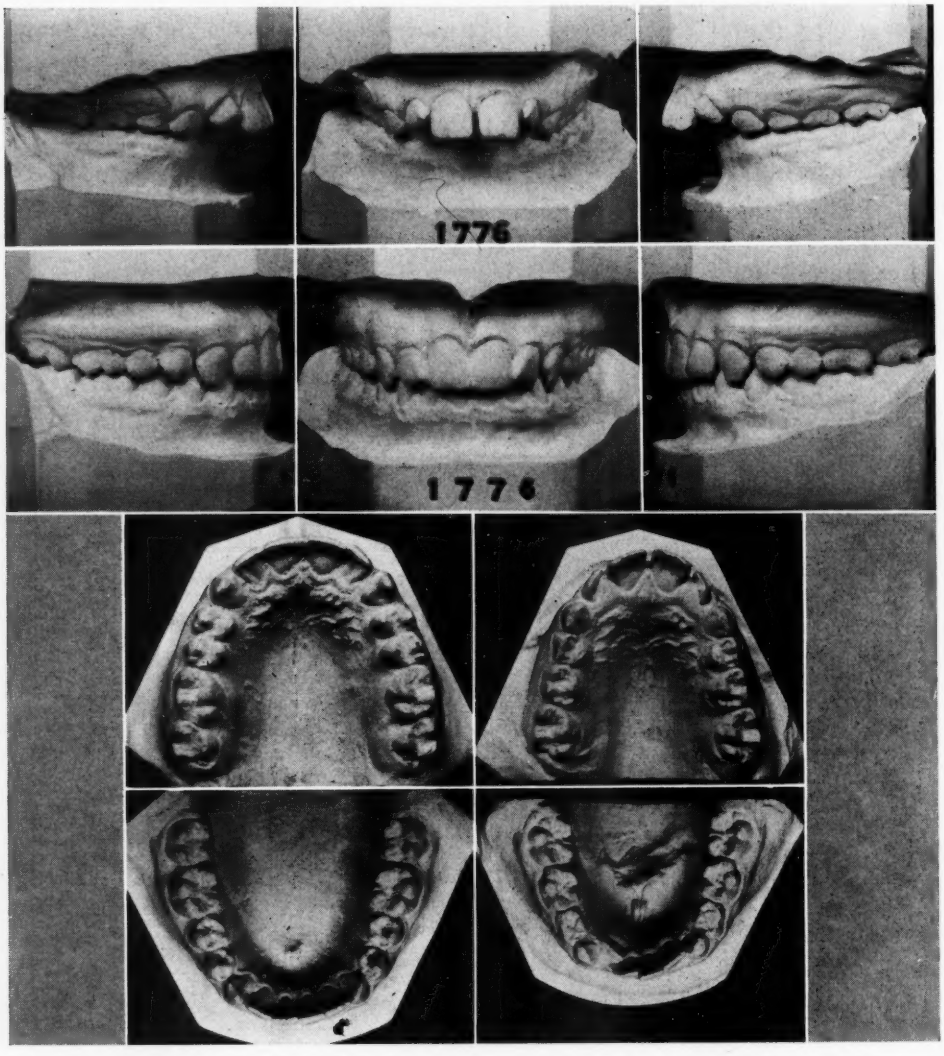

Fig. 18.—Case 1776. Mixed dentition with constricted coronal arches but adequate basal arches compared with permanent arches ten years later. (From Howes: Am. J. Orthodontics, January, 1957.)

Crowded incisors are not always evidence that the supporting bone is deficient in width, however. Fig. 18 illustrates this point. Notice the increased width of the arches and the improved alignment of the mandibular incisors.

A comparison of the survey of the mandibular casts (Fig. 19) at age 8 in the mixed dentition and age 18 in the permanent dentition shows that there has

*This case has appeared before in the literature,[6] and a misleading statement was made in regard to it. It was stated that mandibular coronal arch width increased 8 mm. in the premolar region and that the basal arch width increased 4 mm. in the same region. It should have been stated that the basal arch was 4 mm., wider below the first premolars than below the first deciduous molars, not because there had been an increase in basal arch width but because the premolars were located more distally in a wider part of the arch.

been no change in the size or form of the labial basal arch outline. The permanent cuspids, however, have erupted in more distal positions than their deciduous predecessors occupied. Arch expansion, favorable leeway space, and a good growth pattern all entered into this desirable change.

I tried to find a case in which the apparent increase in the amount of space for the permanent teeth would suggest that there had been an enlargement in this curvature of the mandibular basal arch outline.

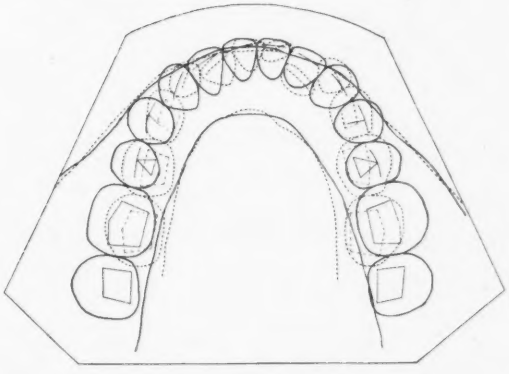

Fig. 19.—Case 1776. Surveys of mandibular casts superimposed. The dotted line represents the mixed dentition at age 8, and the solid line represents the permanent dentition at age 18. Note lack of change in basal arch outlines but increased coronal arch width, permitting more distal positioning of permanent cuspids and greater amount of space for anterior teeth.

Fig. 20 shows a case in which the intercanine width has increased considerably and there is room to spare, with spaces distal to the canines. This case has been treated with maxillary extraoral retraction. At the start of treatment there was a mandibular lingual arch, which held the length of the arch during the transitional stage. Very light auxiliary springs guided the premolars buccally as they erupted. With sufficient basal support, this is a much more effective procedure than trying to expand the arch in the premolar region after the teeth are fully erupted and the alveolar process has formed.

The mandibular appliance in this case had been removed about one year before the second casts were made, and no retention had been used. Notice the increased width of both arches. The surveys (Fig. 21), however, show that there has been no change in the mandibular basal arch outline anterior to the first molars, and the additional space for the teeth is attributed to the fact that, while the cuspids have moved distally, the first molars have moved forward very little to use up the leeway space. I think we can credit good anteroposterior growth, treatment timing, and extraoral force applied to the maxilla for this desirable change.

In a study of more than 100 mixed-dentition cases, it was found that 50 per cent of them had sufficient basal arch width. This number could be increased if, through treatment, the premolars and cuspids could be placed in a more distal, and therefore wider, part of the arch. Of course, there are many

persons with such large teeth, such small arches, or, worse still, a combination of the two, that expansion is out of the question. There are many others, though, in whom the discrepancy is not so great and enough favorable factors are present to encourage the use of expansion as a treatment procedure. I do not believe that we should condemn a patient to a narrow dental arch, out of all proportion to his tooth size and his adult facial dimensions, if it is possible to increase his

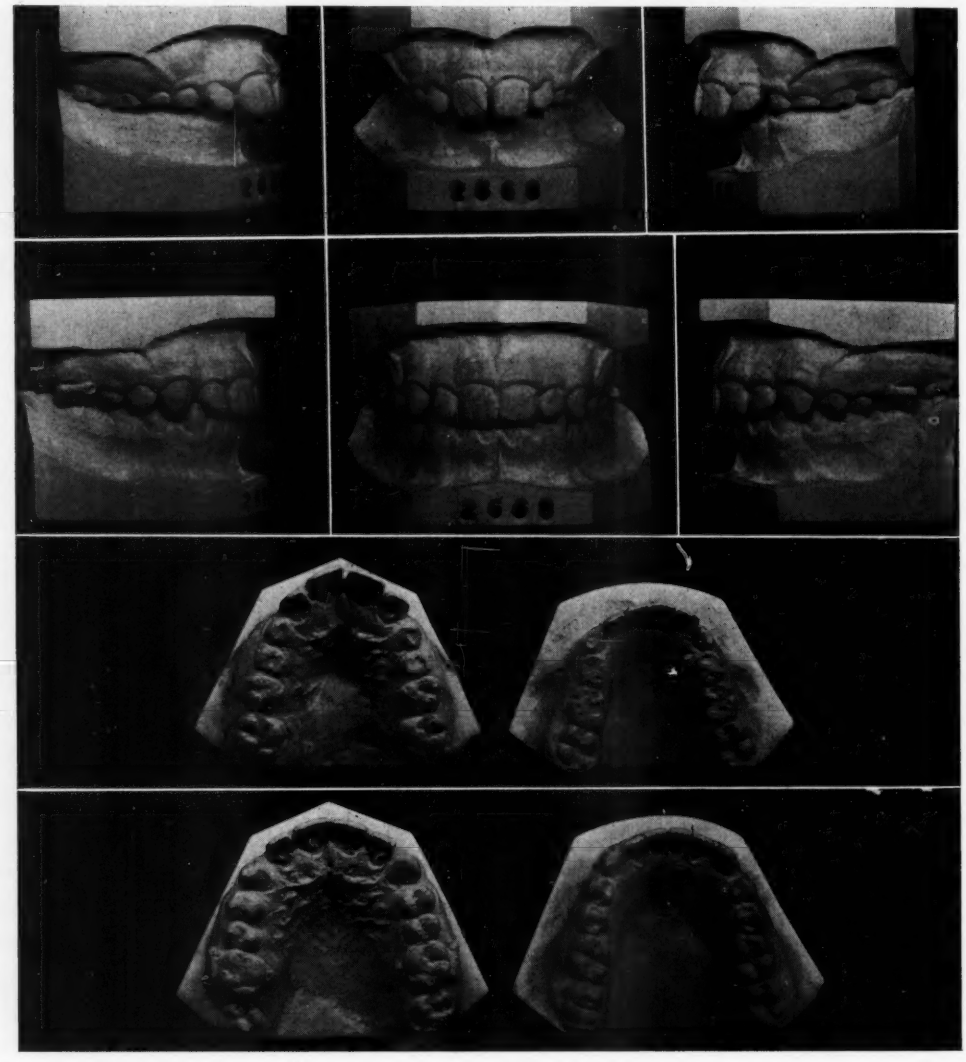

Fig. 20.—Case 2668. Note coronal arch expansion and maintenance of mandibular arch length. There is more than enough space for mandibular teeth. (See text.)

arch width permanently. Nor do I believe that our knowledge of the etiology of inadequate arch width has reached the point that we are on sound ground in totally eliminating the consideration of expansion of these constricted arches as a treatment procedure. It is the selection of cases for this type of treatment that gets us into difficulty. There are so many factors involved that the final

decision will rely principally on clinical judgment. Clinical judgment, however, is merely a rapid summation of all our past experiences and observations which, although we are unable to describe them in words, can still be of very practical value.

Some of the favorable factors which enter into a decision to expand the mixed dentition can be set down as follows:

1. Good facial pattern, or one with good potential, as evidenced by cephalometric radiographs. A Frankfort-mandibular plane angle of less than 28 degrees is particularly important.
2. Good basal arch width, wider than coronal arch width.
3. Good bizygomatic and bigonial width for patient's age, or else exceptionally long arches.
4. Parents with good arch width and with only moderate, if any, crowding of mandibular incisors.
5. Well-developed arches in one or more siblings.
6. Well-formed teeth with little, if any, decay.

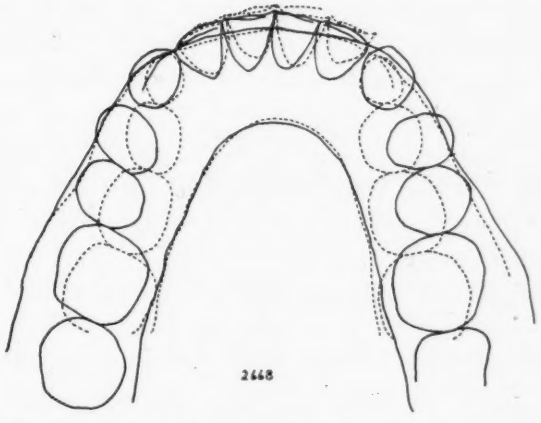

Fig. 21.—Case 2668. Surveys of mandibular casts before and after treatment. Note lack of change in basal arch outlines but increased coronal width and maintenance of arch length.

7. Good muscular balance in a Class I case. (Poor muscular balance is to be expected in Class II cases.)
8. Not more than 89 mm. of mandibular and 98 mm. of maxillary tooth material from first molar to first molar, inclusive. Sizes of the unerupted permanent teeth must be ascertained from radiographs. More than this amount of tooth material will not necessarily contraindicate expansion if the other factors indicate the possibility of obtaining correspondingly large arches.
9. Good arch length, which has not been reduced by premature extraction of a second deciduous molar.
10. Favorable leeway space, preferably 3 mm. or more on each side.

11. Mandibular incisors which, while crowded, are not rotated much.

12. A cooperative child who will wear an extraoral appliance. Generally, the younger children fuss less about this than the older children.

The contraindications for early expansion would be the reverse of the conditions just mentioned.

If we could have some fairly accurate method of deciding which cases can be successfully expanded in the mixed dentition, then many of the others could be treated by serial extraction, and, in my opinion, we would be on sounder ground than we are today.

Almost all (well over 90 per cent) of the children who come to the orthodontist's office in the mixed-dentition stage of dental development have narrow coronal arches—not foreshortened arches, as one is led to believe through the current misuse of the term "arch length." There is generally plenty of length. The crowding is due to lack of arch width, and any extractions of deciduous teeth with serial extraction procedures in mind are done because of this lack of arch width. In our cephalometric studies of the anteroposterior proportions of the face, we should not lose sight of the fact that our biggest problem is still arch width, and I think that we should definitely continue to direct some of our efforts toward a better understanding of this problem.

CONCLUSIONS

The basal arch outline, from mandibular first molar to mandibular first molar, alters little if any after the age of 5 years or perhaps, as Hunter indicated, much earlier.

In selected cases, coronal arch form can often be enlarged during the mixed-dentition and transitional stages of development. Because of the additional space created by this procedure, the cuspids can be moved distally into a wider part of the arch.

In spite of a number of known indications for the selection of such bases, many obscurities remain. In those cases in which expansion is definitely contraindicated, serial extraction may minimize our treatment problems.

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650 MAIN ST.

DENTAL HEALTH AND CHILD DEVELOPMENT

FREDERICK R. ALDRICH, D.M.D.,* COLUMBUS, OHIO

WHEN dentists speak of the oral health of the growing child, they are concerned with the condition of a major organ whose proper development and normal functioning are of prime importance for the child's total health.

The eruption of the deciduous teeth occurs at that period in the child's life when he begins to form the articulate sounds that make communication with the outside world possible. How successfully he will communicate with the outside world (now and long after he has shed his deciduous teeth) depends to a large degree on the shape, the arrangement, and the health of these first teeth and their related structures.

This is also the period in which the child begins to show his feelings to the outside world in the expression of his face. His success in this also depends to a large measure on the condition of his teeth, whether his happiness manifests itself in an attractive smile or in a grimace. Finally, this is the period in which the child develops proper eating habits. Efficient mastication is necessary for digestion, and the proper function of the masticatory musculature is necessary for the development of the jaws and face.

Communication, nutrition, facial expression, and facial formation—these are the areas with which we are concerned when we speak of the oral health of the child. We cannot speak of the teeth without speaking of the mouth. We cannot speak of the mouth without considering the face. Moreover, we cannot speak about the health of the teeth, the mouth, and the face without speaking about the child's total physical and emotional health.

The human organism is, by its nature, that kind of miraculous thing in which no part lives alone but in constant interaction with all others. Consequently, this one human organism has only one health, and this one health is adversely affected whether you cut your big toe or have a decayed or crooked tooth. Somehow, we tend to think of teeth as mechanical devices that are superficially attached to the jawbones and have little or no vital connection with our body. This misconception concerning teeth probably stems from the fact that they can be so easily extracted and quickly replaced.

Read before the Golden Anniversary White House Conference on Children and Youth, Washington, D. C., March 27 to April 1, 1960.

*Chairman, Public Relations Committee, American Association of Orthodontists.

In Nature's marvelous design, however, the smallest tooth in the tiniest mouth has a reason for being there. It has its own role in the mastication of food, in the function of speech, in facial expressions, and in the stimulation needed for the proper growth and development of the gingivae, jaws, face, and head. If this tooth could be dispensed with without disturbing the harmonious interplay of all parts of the wonderful human machine, why did Nature put it there, in exactly this shape and with this particular function?

Because dental health is inseparable from general health, dentists are vitally concerned with the dental health of the very young. The pattern of dental health is formed and established in early childhood. Neglect of teeth in the formative period, whether they are deciduous teeth or permanent teeth, may result in the loss of a health asset that the most skillful artificial replacements or corrections can never restore to its original natural quality.

Permit me to illustrate this concept of oral health with an example from my own field of dental specialty, orthodontics. Orthodontics is concerned with the detection, prevention, and correction of irregularities in tooth position and jaw relationship. The technical term for this condition is malocclusion of the teeth, or defective bite. It exists when, upon closure of the jaws, the upper and lower teeth do not fit together properly. Malocclusion of the teeth develops most commonly during the time that the child's deciduous teeth are being shed and his permanent teeth are erupting. Statistics on the prevalence of malocclusion among children vary, but it can be safely assumed that about 30 per cent of the children in any age group are in need of some kind of orthodontic treatment.

How, and to what extent, can malocclusion affect the child's health? Our teeth depend upon each other for normal development, proper position, and efficient function. Malocclusion upsets this delicate balance of the teeth. The child may find it difficult to chew food. If he does not chew well, he may develop digestive problems. Without proper chewing there is no proper digestion. Malocclusion may also prevent the child from selecting foods necessary for adequate nutrition. He will tend to avoid rough-textured food and develop a preference for soft foods, but vigorous chewing of tough foods is a prime requisite for the proper development of the jaws and many muscles of the face. Moreover, irregular teeth will interfere with the movements of the tongue in speaking. This is especially critical at any age when the child develops speaking habits that are not easily corrected, once they have been acquired. In addition, one or more irregular teeth, or an inherited or acquired malposition of the jaws, may cause further displacement of other teeth. This can cause injury to the gingivae, the jawbone, and the tissues surrounding the teeth, and sometimes it causes loosening of the teeth. It is also more difficult to keep irregular teeth clean and to prevent their decay. Malocclusion, from any cause and in any form, can play havoc with the teeth, the mouth, and the face and eventually lead to a serious deterioration of health in the areas of mastication, digestion, speech, expression, and facial formation.

It is easy to see to what an extent malocclusion can become a threat to a child's physical health. Not as obvious, but at least equally serious, is the harmful effect of dental deformity on a child's emotional health. Childhood and early adolescence are important periods of social development and adjustment, during which boys and girls become acutely aware of social pressure and relationships. They are periods when the opinions and attitudes of others count, especially regarding acceptance and rejection. Any deviation in dress, appearance, or manner from the mode of the group is actually painful, as the child, who does not conform is open to ridicule. Recognizing these factors, we can easily understand the interplay of the effects of "ugly teeth." Because of his unfortunate personal appearance, which so vitally affects social standing with others of his crowd, the child is set apart from the group in which he is trying to become a member. Conflict and instability are accentuated. The child becomes emotionally disturbed, emotionally sick.

I have chosen orthodontics as a means of demonstrating the relationship between general health and dental health. Of course, this relationship can be demonstrated in any field of dentistry. The dental health problem is a complex one. The dental health, above all, of the growing child, reaches into all phases of his development and into all areas of his environment—school, home, and community. Neglect of any area of dental health has far-reaching effects on the total life and growth of the individual throughout his life.

How can we cope with the problem of dental neglect among our youth? The prime target of our efforts, I believe, must be the parents. They are the prime dental health educators of the growing child. We must convince them of the serious consequences of dental neglect in terms of the total health of their children. We must dispel the false notion that the deciduous teeth are unimportant because "they fall out anyhow." Deciduous teeth require the same careful attention and care as permanent teeth. Formation of jaws, facial expressions, speech habits, and social adjustment all depend upon sound, well-shaped, and properly functioning deciduous teeth. We must teach the parents that the child's first visit to the dentist should be a pleasant experience, not one prompted by and associated with the discomfort of a toothache. We must prove to them that the high cost of dental care is actually the high cost of dental neglect, that frequent and regular visits to the dentist are far less costly than one single treatment made necessary by their paying scant attention to the health of the child's mouth. We must speak of the importance of proper diet for the development and maintenance of healthy teeth and of the dental destruction caused by sweets.

This job of dental education and motivation must begin in the home, but it must not stop short of the school and community. The greatest contribution that a community can make to improve the dental health of its children is the fluoridation of its public water supply. Raising the fluoride content of a community water supply to an optimum level is now generally accepted as an effective, safe, and economical method of preventing much tooth decay. Children who have drunk fluoridated water since birth can expect about 60 per

cent less tooth decay than children who have not had this advantage. Benefits derived in childhood last throughout adulthood. Fluoridation, good dental care at home, regular visits to the dentist, and a constant awareness of the serious physical and emotional consequences of dental neglect will provide our children with dental health benefits that they can enjoy as long as they live.

17 North Harding Rd.

CRANIAL DEFORMATIONS AMONG THE GUANES INDIANS OF COLOMBIA

CARLOS PÉREZ-MARTÍNEZ, D.D.S., BUCARAMANGA, COLOMBIA

THE unexpected interest shown in two previous articles has encouraged me to do further research and writing on the cranial deformations among the Guanes Indians. The first of these articles was published in the *Journal of the Colombian Federation of Odontology* under the same title as this one. The second article, which appeared in the same publication, included a number of photographs of deformed Guanes Indian craniums that were found in ancient cemeteries on a high plateau known as the Mesa de los Santos in the Department of Santander in eastern Colombia. To obtain more information, I personally visited the museum in the city of Socorro, where I was able to obtain additional photographs of deformed skulls which had come from those lands formerly inhabited by the Guanes Indians.

Darwin tells us that throughout history man has deformed himself for a number of reasons. He has painted his body to terrify the enemy in battle. He has made certain types of multilations in the observance of religious rites. He has used certain marks to denote the achievement of manhood. Some marks have been used to indicate a person's place in society, and others have been employed to distinguish one tribe from another.

Darwin, however did not mention one very important reason for these bodily mutilations—making the individual more attractive. These mutilations have been of many types, ranging from the bound feet of the Chinese woman of high society to the use of the expression-altering monocle. Today we see the "modern woman" plucking her eyebrows to enhance her beauty.

It is not the purpose of this article, however, to go into an unnecessary debate over why people throughout history have seen fit to alter their appearance. Such practices have been followed on the islands of the Pacific, in Asia, in Europe, and in the Americas. In no sense were the actions practiced by the pre-Colombian Indians unique. Very seldom mentioned is the so-called "Toulusian deformation" which was often seen in France until recent times. This deformation is achieved by tightly wrapping strips of cloth around the heads of children, the result being an elongation of the cranium. Such elongated heads can be found in all parts of Europe, with the exception of Spain, and have been fully explained by Virchow, Broca, Pokrosky,[3] and other anthropologists.

Imbelloni, basing his findings on 2,350 metric measurements on ninety-four American craniums selected from the museums of Buenos Aires, has concluded that cranial deformations can be divided into two large classes—tabular and annular. The tabular deformations, which result from occipitofrontal compression, can be further classified as tabular and erect (Figs. 1 and 2). Each

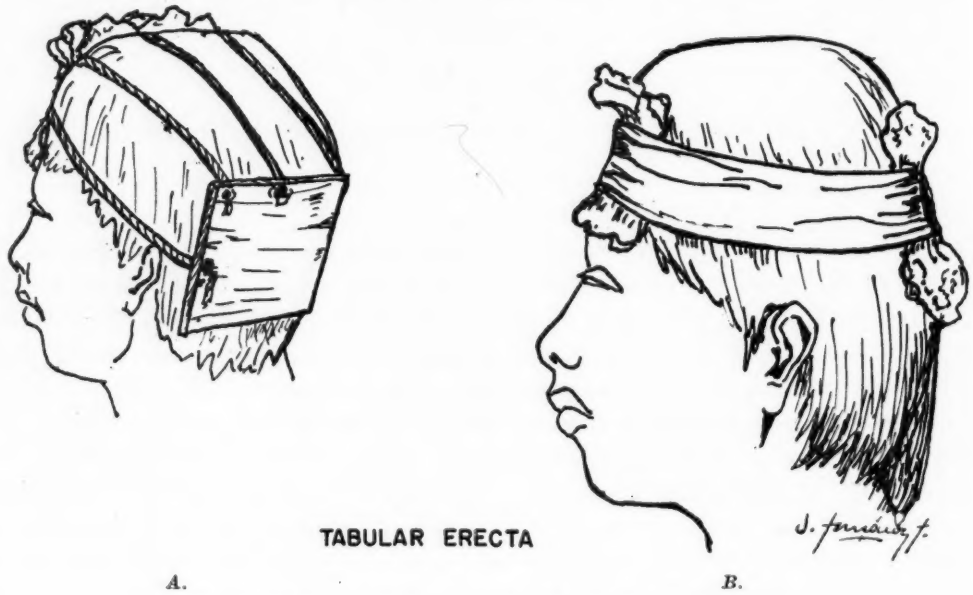

Fig. 1.—Tabular *(A)* and erect *(B)* cranial deformations.

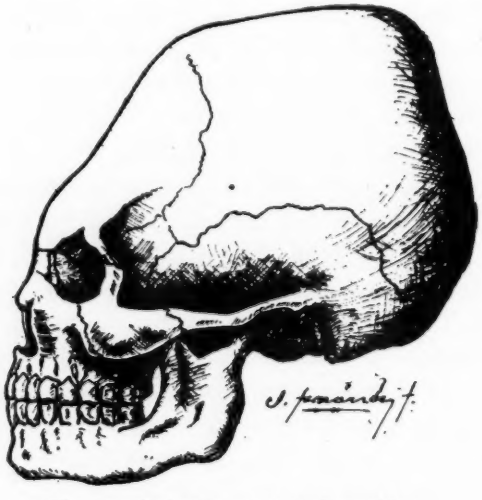

Fig. 2.—Tabular erect deformation.

of these is caused by a definite instrument. The tabular deformation is produced by binding pieces of wooden slabs around the head, whereas the annular deformation is achieved by binding the head with strips of cloth (Fig. 3).

The illustrations for this article were prepared under my direction by a local artist, J. Fernández, to show clearly the classes of deformation resulting

from each instrument. These drawings, copied from x-rays and photographs secured from the Casa de Bolivar in Bucaramanga and from the museum in Socorro, show the deformations common among the Guanes Indians.

It should be remembered that increased intracranial pressure produced by brain development was enough to modify the deformation caused by the deforming device. In other words, regression toward normality took place. Therefore, it is useful to estimate the possible age of the skulls, which may be done with some accuracy up to the age of 30 years (Figs. 4 and 5).

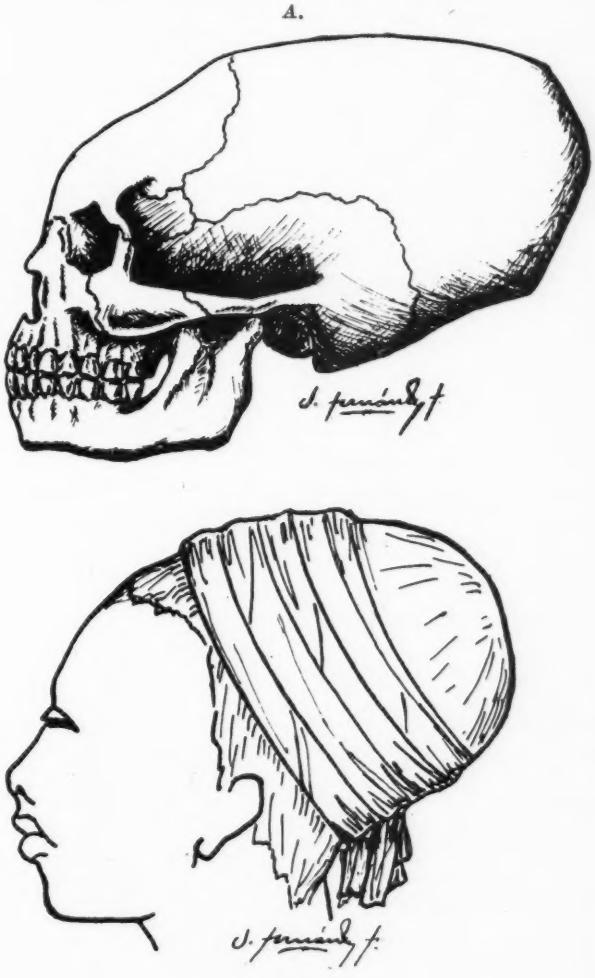

Fig. 3.—Annular deformations. *A*, Effect on skull. *B*, Method of binding the head.

Historical references regarding these cranial deformations among the pre-Colombian Indians are frequent. Among them are those from Cieza de Leon in the *Crónica del Perú* which describe the customs and methods employed by the Indians.

In summary, the reasons for cranial deformations are varied, as was stated at the beginning of this article. In addition to the reasons mentioned, the

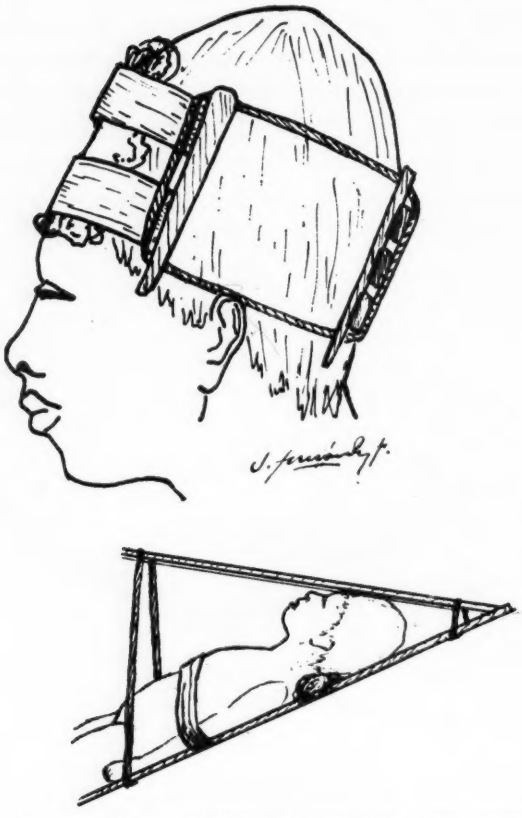

Fig. 4.—Method of obtaining oblique skull deformation.

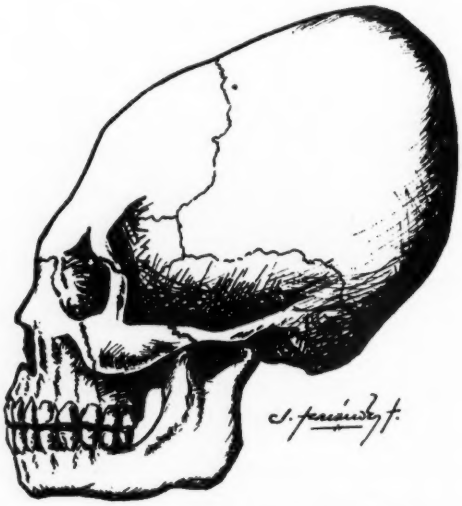

Fig. 5.—Oblique deformation of skull.

balancing of heavy burdens on the head, a practice common among certain tribes of Africa, must not be overlooked.

Among some primitive peoples, violent and painful extraction of the teeth was a common practice. These extractions were performed to demonstrate a tribe member's ability to bear pain or, in some cases, to permit a tetanus victim to take nourishment. In none of the skulls examined did I find evidence of such extractions. On the contrary, most of the teeth were present in the majority of Indian skulls that I examined, and there was little evidence of cavities. In general, the teeth appeared to be well shaped and complete.

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3. Dembo, A., and Imbelloni, J.: Deformaciones Intencionales del Cuerpo Humano, Buenos Aires, Editorial J. Anesi.

34-34 Carrera 18.

A PATIENT- AND PRACTICE-PROTECTION PLAN

WILLIAM S. PARKER, B.S., M.S., D.M.D.,* SACRAMENTO, CALIF.

PERSONAL experience with the problems confronting the widows of orthodontists motivated me to write "Death and the Orthodontist" (AM. J. ORTHODONTICS **41**: 188, 1955). Further experience with this problem and the companion problem caused by disability convinces me that still more effort is required to prepare our practices for unforeseen emergencies. Centuries ago shipowners and other merchants adopted a system for sharing risks which has been called insurance. Orthodontists today may follow the same scheme and mutually arrange to share their risks.

Basically, any insurance plan is founded on probabilities and the calculated means to meet these probabilities. For example, life insurance is based on a mortality table which clearly shows that of 1,000 men of a given age a certain number will perish. The risk may then be easily assigned and shared by all 1,000 men equally.

Every practicing orthodontist must face the possibility that he might be the one struck by disaster, and he should participate in a plan to share the risk. Since experience has shown that mere money will not solve our problems, many men have adopted the more ancient and fundamental plan upon which all insurance was originated, namely, an agreement to share the risks personally!

Many individuals and groups have produced agreements to formalize this endeavor, and perhaps a plan should be tailormade for each group. The approach which has found most favor is one in which two or more practicing orthodontists join together in a mutual assistance plan whereby each recognizes his own susceptibility to loss of practice time because of sickness or accident or, worse yet, to termination of his practice due to permanent disability or death. With this common understanding, they then agree mutually and severally to aid each other if the need should arise.

This sounds simple enough, and to those inexperienced in such matters a verbal agreement perhaps seems adequate. It is not. Invariably, misunderstandings or personality differences enter the picture and the agreement is usually rendered unworkable in time of stress. Oddly enough, an unexpected source of very real potential trouble rests in the spouse of each of the participating parties. It is not my purpose in this article to elaborate and theorize on the psychological motivations and variations of wives, but I do want to state clearly

*Consultant, School of Dentistry, University of California.

and forcefully that the wives must be thoroughly indoctrinated in such an agreement in theory and that their participation must be formally acknowledged. While a wife is not a partner in practice, she is most certainly a partner in life, and anything affecting life as directly as income is a matter of intense concern to her, most particularly when she is under the stress of a situation involving her husband's health and ability to practice.

The agreement presented here is the result of much study and research and the cooperation and kindness of many orthodontists, lawyers, accountants, and others. Some parts of this agreement may not fit some individuals or groups, but it will provide a firm basic pattern for any plan.

AGREEMENT

This agreement is made and entered into this _____ day of _____, 19____ by and between Dr. _____ and his wife _____; Dr. _____ and his wife _____; Dr. _____ and his wife _____; and Dr. _____ and his wife _____.

RECITALS: All of the men who are parties to this agreement are orthodontists practicing their profession in _____ County. Each recognizes that in the event of his death or disability his patients would suffer considerable inconvenience and that his widow or estate would be placed in a difficult situation regarding the sale or liquidation of his practice. Each recognizes that it would be to his advantage to enter into a mutual agreement which would provide for maintaining his practice in the event of his disability or death and provide for a reasonable compensation to the orthodontists who would devote their time to the practice for that purpose.

Each of the women who is a party to this agreement recognizes that the conduct of an orthodontic practice requires technical skill, training, and experience possessed only by the orthodontists themselves.

AGREEMENT: In consideration of the mutual promises and agreements herein set forth, it is agreed as follows:

1. In the event of the death or disability of any one of the parties to this agreement, the other parties hereto shall carry on the practice of the disabled or deceased party upon the terms and conditions herein set forth. They shall make arrangements among themselves for devoting time on a rotation basis, so that as far as possible it meets the convenience of all parties and is sufficient to take care of the practice. It is intended that the time shall be divided as nearly on an equal basis as possible, and that each of the parties who devotes time under this agreement shall be compensated therefore on the basis of _____ for each full day and on a pro rata basis for portions of days.

2. In the event of disability by reason of sickness, this agreement shall take effect upon one week's notice. In the event of disability by accident, this agreement shall take effect immediately upon notice to the other parties. In the event of death, this agreement shall take effect immediately after appointment of a representative of the estate with authority to make decisions for the estate and upon notice to the other parties, but during the interval the other parties shall give the widow such advice and assistance as they find possible.

3. In the event of the temporary disability of a party to this agreement, his practice shall be so conducted for a period not to exceed six (6) months. In the event of permanent disability or death of a party, his practice shall be maintained during a sufficient period of time to permit arrangements to be made for patients under treatment and to provide an opportunity for the sale of the practice and/or the equipment at a reasonable price, and the parties hereto shall be free from any legal or moral obligation to devote services over a period of time in excess of six (6) months, unless there be pending negotiations at the expiration of that time which portend a favorable consummation of a sale.

4. In the event of the death of a party hereto, the other parties further agree to assist the widow or representative of the estate in any matter which is right and ethical, particularly with regard to the sale or disposal of the practice and/or equipment.

5. It is intended that the orthodontists signing this agreement shall be permitted to conduct the professional aspects of a practice in accord with their considered joint conclusions. In the event of death, should the representatives of the estate disagree with the joint conduct of the practice, the men doing the work shall be free to dissociate themselves from the terms of this agreement without further moral or legal obligation.

6. The intent and purpose of this agreement is to establish a moral obligation to furnish mutual assistance under the circumstances outlined herein and to establish in advance the terms under which such assistance should be provided. It is agreed that performance may not specifically be enforced and that no party shall be liable in damages for failure to perform, and any claim of or right to damages by reason of such failures by any party is hereby waived.

7. This agreement is not intended, and shall not be so construed, to establish a partnership or joint venture.

Dr. "A"	Dr. "B"
Dr. "C"	Dr. "D"

The undersigned, as wives of the parties to the foregoing agreement, hereby approve, join in, and consent to the said agreement.

Mrs. "A"	Mrs. "B"
Mrs. "C"	Mrs. "D"

A few words of explanation may be helpful, for some of these clauses will appear unduly harsh to the uninitiated. The first paragraph, which provides for individual financial compensation, should be further implemented by each individual with adequate health and accident insurance. Financial compensation may be omitted by some, but sufficient compensation to meet basic overhead needs of the active participants does much to ensure continuing friendship and fellowship. The inexperienced may question the inclusion of such a clause, but the experience of many groups has shown that omission of this detail may be the final blow to a strained situation. This agreement is designed to be workable and to consider the practical aspects of the problems involved, and *money* is one of the problems involved. An emotional approach to this affair will produce an emotional agreement which will certainly explode in a period of great emotional strain!

The second and third paragraphs provide for certain time intervals to govern actions under the agreement. Here the participants simply set up a clear frame of reference for responsibility; without this explicit agreement, events may transpire to produce relatively untenable situations without a suitable method of termination. Even painfully unpleasant situations may be endured for a specified period by all parties concerned when the conclusion may be clearly seen.

The fifth paragraph simply recognizes that "the best laid plans of mice and men" may very well go astray and often do so when ill-informed but well-meaning persons are liberal with advice which is contrary to the decisions of persons with the professional training necessary for the conduct of an orthodontic practice.

The sixth paragraph restates the essence of this agreement, which is that this is a joint venture among men and women of good will and not a legal instrument or contract. Without the very real good will of all parties, the basic concept is flawed and the whole thing is worthless. Experience has shown that sincere acceptance of the principles expressed here will produce a working pattern to solve all kinds of emergencies, but failure to accept them usually results in dismal disappointment. The space for signatures may very well be omitted, for the crux of this solution lies not in hastily scrawling one's name on a document but in an honest personal resolve to do one's part.

Very few persons are self-inspired to purchase life insurance or disability insurance; they are usually "sold" by an energetic and persuasive salesman. This article is offered in the hope that more orthodontists may be motivated to protect one of their most valuable assets—their own orthodontic practices.

2430 L St.

Editorial

A PUBLIC HEALTH ORTHODONTIC SURVEY

A CONFERENCE on Public Health was held in Washington, D. C., on April 23, 1960, just before the annual session of the American Association of Orthodontists. Prior to the Conference, invited participants, as well as the members of the Committee, had received a draft entitled: "A Suggested Study to Be Undertaken by the American Association of Orthodontists to Determine the Prevalence of Physically Handicapping Defects Requiring Orthodontic Interference and the Availability of Personnel and Facilities to Provide the Orthodontic Care." In view of the many preconvention activities going on simultaneously, the turnout was remarkable and reflected a strong interest in the problem of physically handicapping orthodontic defects.

George M. Anderson, President of the A. A. O., welcomed the group. J. A. Salzmann, Chairman of the Committee on Public Health, reviewed the background of the proposed study and the need for such a project. David B. Ast, consultant to the A. A. O. Committee on Public Health, outlined the proposed study as follows:

> The rehabilitation of children with physically handicapping defects has been the concern of state authorities throughout the nation. While the details of state laws governing rehabilitation programs may vary, they are essentially comparable in their definitions of what constitutes a physical handicap. Only within recent years, however, have dental defects requiring orthodontic care been considered among the physically handicapping defects.
>
> In order for the American Association of Orthodontists to lend its most effective support in this public health approach to orthodontic care, it would be helpful to know something about the extent of this problem and what is needed to provide adequate corrective care.

The objectives of a proposed nationwide study as described by Dr. Ast, would be (1) the determination of prevalence of handicapping orthodontic conditions in the 12- to 16-year age group in the United States, and (2) the determination of personnel and facilities available for their correction.

The eight regional societies of the Association, corresponding to eight geographical divisions of the United States, will be asked to cooperate in the survey. The sampling will be based on age, sex, race, color, socio-economic level, and area of residence (urban or rural). Using an objective index, members of the A. A. O. will be able to make comparable measurements.

Dr. Ast stated further that for some time the New York State Bureau of Dental Health has been using the HLD index* in collecting data on children applying for orthodontic care under the Dental Rehabilitation Program. This will be continued in conjunction with simultaneous clinical (subjective) evaluation.

It is quite appropriate that such a study be done by the American Association of Orthodontists, rather than by any outside agency. There seems to be an increase in the number of communities adopting dental rehabilitation programs and, while the profession has some idea of the prevalence of malocclusions, we do need data on the extent of handicapping orthodontic problems in our children.

The need for such information seems to be emphasized also by the outcome of the 1950 and 1960 National White House Conferences on Children and Youth. Practically all who spoke on physical handicaps in children spelled out the need for orthodontic care of children with severe malocclusions.

The Board of Directors of the American Association of Orthodontists accepted the report of the Committee and voted support of the proposed survey. The JOURNAL will keep the membership informed of further progress from time to time. Communications relative to the survey are welcome and should be mailed to Dr. J. A. Salzmann, 654 Madison Ave., New York 21, New York.

J. A. S.

*Draker, H. L.: Handicapping Labio-Lingual Deviations: A Proposed Index for Public Health Purposes, AM. J. ORTHODONTICS 46: 295-305, 1960.

In Memoriam

BERNHARD W. WEINBERGER

BERNHARD WOLF WEINBERGER died on May 8, 1960, in New Orleans, Louisiana, where he had resided since his retirement in 1958. He was 74 years of age.

Dr. Weinberger, who spent his active years in the practice of orthodontics in New York City, was one of the pioneer specialists in orthodontics and undoubtedly the No. 1 historian of all dentistry. He published two volumes on the history of orthodontics, in addition to other books on dentistry.

A native of Idaho Springs, Colorado, he received his dental education at the University of Pennsylvania and the Angle School of Orthodontia. During his long career, he served as lecturer in dentistry at the New York University College of Dentistry and as special lecturer in orthodontic history at the University of Pennsylvania and the Baltimore College of Dental Surgery. A quiet, dedicated man, Dr. Weinberger was so modest that only a few realize that he did more writing on the subject of dentistry than probably any other man who ever lived. As one of the most prolific writers for the INTERNATIONAL JOURNAL OF ORTHODONTIA during and just after World War I, he was a great and constructive force in the creation of the specialty of orthodontics. It is doubtful that he can ever be replaced, for a man must be truly dedicated to spend the days and nights and hours that he did writing about his favorite subject—orthodontics.

Dr. Weinberger served as vice-president of the Seventh International Dental Congress in 1927, as United States reporter-secretary of the Ninth International Dental Congress in Vienna in 1929, and as librarian of the New York Academy of Medicine. He was a member of the American Dental Association, the American Medical Association, the New York Academy of Medicine, the American Society of Medical History, the International College of Dentists, the American Association of Orthodontists, Fédération Dentaire Internationale, Delta Sigma Delta, Sigma Epsilon Delta, Omicron Kappa Upsilon, and Pi Gamma Mu and an honorary member of the Mexican Orthodontic Society. He was a member of B'nai B'rith, a 32nd-degree Mason, a national trustee of the National Home for Jewish Children in Denver, and was listed in *Who's Who in America.*

Dr. Weinberger is survived by his widow, Louise Haimes Weinberger; a son, Bernhard Simon; a daughter, Mrs. Joseph Schwartz; and five grandchildren.

A profile to be published later in the AMERICAN JOURNAL OF ORTHODONTICS will record the many contributions made by this man during his lifetime of service to his profession.

Department of Orthodontic Abstracts and Reviews

Edited by
Dr. J. A. Salzmann, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Practical Oral Surgery: By Henry B. Clark, Jr., M.D., D.D.S., Chairman, Division of Oral Surgery, School of Dentistry, University of Minnesota; Head, Hospital Dental Service, University of Minnesota Hospitals; Diplomate, American Board of Oral Surgery; Member, American Society of Oral Surgeons. 2nd Edition. Philadelphia, 1959, Lea & Febiger. 469 pages; 509 illustrations on 279 figures. Price, $9.50.

This book was written specifically for dentists and dental students with limited reading time. It contains information on the care of oral surgical conditions seen in daily practice. Glossaries of terms are given at the beginning of chapters on oral surgical diseases. Illustrations have been carefully selected.

Much new descriptive material has been added, especially in chapters on oral surgical technique, infections, injuries, and deformities. Indications for taking biopsies and techniques for performing them are given additional coverage. The operation for correction of mandibular prognathism by subcondylar vertical osteotomy is described and illustrated in detail. Needed medical information is included.

J. A. S.

Pathologic Physiology of Oral Disease: By Richard W. Tiecke, B.S., D.D.S., M.S., F.A.C.D., Professor of Pathology, Northwestern University Dental School; Consultant to the Veterans Administration Research Hospital and Veterans Administration Dental Training Center, Chicago, Illinois, the United States Naval Hospital at Great Lakes, Illinois, and the United States Public Health Hospital, Chicago, Illinois; former Deputy Chief of the Oral Pathology Branch, Armed Forces Institute of Pathology; Orin H. Stuteville, B.S., D.D.S., M.D.S., M.D., Professor and Chairman of the Department of Maxillofacial Surgery and Chairman of the Department of Oral Surgery, Northwestern University Dental School; Lecturer in Surgery, Northwestern University Medical School; Consultant to the United States Veterans Administration, United States Public Health Hospital, Chicago, Illinois, and the United States Naval Hospital, Great Lakes, Illinois; and Joseph C. Calandra, M.D., Ph.D., Professor and Chairman of the Department of Pathology, Medicine and Bacteriology, Northwestern University Dental School. St. Louis, 1959, The C. V. Mosby Company. 637 illustrations, 480 pages. Price, $11.50.

From the title of this text, we deduce that it deals with the manner in which oral diseases manifest themselves. There are 637 illustrations in this book of 480 pages, which indicates that the book is mainly descriptive. Of special interest to orthodontists will be the chapter on anomalies of teeth. The anomalies

of embryologic origin are classified according to the chronologic development of the teeth. This includes the various stages in the life cycle of teeth.

The genesis of supernumerary teeth is discussed from its various aspects. Caries of the deciduous teeth with periapical infection is presented as a cause of asymmetrical tooth formation.

In addition to the discussion of specific inflammatory oral lesions, we find an account of allergic causes of various abnormalities of the soft tissues. An interesting chapter is the one on oral manifestations associated with metabolic and deficiency changes. Proliferative changes of the soft tissues are given due attention.

While the practicing orthodontist is primarily concerned with mechanotherapy, it is nevertheless important for him to have an understanding and awareness of pathologic changes which may occur in the oral cavity. This text can serve as a reference for the orthodontist.

J. A. S.

News and Notes

Central Section of the American Association of Orthodontists

The Central Section of the American Association of Orthodontists will hold its annual meeting at the Park Plaza Hotel in St. Louis, Missouri, Sept. 18 to 20, 1960. The program will be dedicated to the late Benno Lischer.

The schedule for the meeting follows.

September 18

2 to 5 P.M.	Registration, Park Plaza Hotel lobby.
5 P.M.	Cocktail party.

September 19

8 A.M.	Registration.
9 A.M. to Noon	Scientific sessions.
Noon	Luncheon and business meeting.
2 to 5 P.M.	Scientific sessions.
6 P.M.	Cocktail party.
8 P.M.	Dinner dance.

September 20

8 A.M.	Registration.
9 A.M. to Noon	Scientific sessions.
Noon	Luncheon and business meeting.
2 to 4 P.M.	Table clinics.

Southwestern Society of Orthodontists

The next annual meeting of the Southwestern Society of Orthodontists will be held at the Town House Hotel in Kansas City, Kansas, Sept. 25 to 28, 1960. A list of essayists and their subjects follows.

William L. Wilson, Boston, Massachusetts:

The Middle Road Approach to Orthodontics.

Hamilton B. G. Robinson, Dean, School of Dentistry, University of Kansas City, Kansas City, Missouri:

A Dental Educator Views Orthodontic Education.

Arthur F. Lindquist, Jr., Kansas City, Missouri:

Prosthodontic-Orthodontic Procedures Involved in Cleft Palate Rehabilitation.

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Denver Hilton Hotel in Denver, Colorado, April 10 to 15, 1961. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. Alton W. Moore, University of Washington School of Dentistry, Seattle 5, Washington.

Applications for acceptance at the Denver meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1961. To be eligible, an applicant must have been an *active* member of the American Association of Orthodontists for at least two years.

Denver Summer Meeting

The program has been completed for the twenty-third annual Denver Summer Meeting for the Advancement of Orthodontic Practice and Research, which will be held at Writer's Manor in Denver, Colorado, July 31 to Aug. 5, 1960. The following participants will present papers:

Harold S. Born, D.D.S.

Topic of discussion: "Aids in Case Presentation."

A means of better educating your patients in order that they may assume more of their rightful responsibilities, thus making the practice of orthodontics more pleasant and efficient for both you and your patients.

Joseph R. Jarabak, D.D.S., M.S., Ph.D.

Topic of discussion: "The Biomechanical Aspects of Light and Light Differential Forces in the Treatment of Malocclusions."

Subtitles:

1. Biologic and Physiologic Considerations of Light Wire Forces (Optimum Forces) in Orthodontics.
2. Theoretical Mechanics Applied to the Use and Control of Light Forces From Highly Resilient Wires.
3. Treatment Planning and Clinical Procedures in the Treatment of (1) Nonextraction Malocclusions and (2) Malocclusions Requiring the Extraction of Teeth.
4. Sequence in the Treatment Chronology of Nonextraction and Extraction Malocclusions. (A simultaneous panoramic showing of the original malocclusion, the intervening treatment steps and the progress between each step, and finally the finished case. The treatment history and the finished result unfold before the viewer's eyes at one time through the medium of panoramic projection.)

James Jay, D.D.S.

Title: "Total Extra-Oral Therapy."

Topics of discussion:

1. An Anatomical and Etiological Basis for Orthodontic Procedure.
2. A Diagnostic Test of Orthodontic Therapy.
3. The "Harnessing" of Growth in Treatment Planning.
4. Total Extraoral Appliance Technique.

5. Extraoral Therapy as a Complete Approach to Orthodontic Treatment, Rather Than as an Aid to Other Therapies.

Phillip H. Starr, M.D.

Topics of discussion:

1. Introduction—The Psychiatric Approach; Its Basis and Rationale.
2. The Psychological Aspects of Orthodontic Practice.
3. The Psychological Aspects of Thumb-Sucking as it Relates to Dental Malocclusion.

Entertainment has not been neglected. This consists of the annual supper on the evening of July 31 for all in attendance. Members of the twenty-third annual meeting and their families will enjoy famous old Central City and dinner at the historic Teller House, followed by a play in the Opera House, on Tuesday evening.

Hotel reservations should be made directly with Miss Kilgore, Writer's Manor, 1730 South Colorado Blvd., Denver, Colorado. Mention that you are with the Denver Summer Meeting, as a block of rooms have been reserved for our group. It is the opinion of the Board of Trustees that Writer's Manor will afford the finest of accommodations, as it has in the past. It has a variety of eating places, excellent food, air-conditioning, a swimming pool, and a minimum of noise.

Attendance is limited, and applications will be given preference in the order of their return.

Notice of Annual Meeting of Members

The annual meeting of members of the Association for the Denver Summer Meeting for the Advancement of Orthodontic Practice and Research will be held in the lecture hall, Writer's Manor, Denver, Colorado, on August 5 at 11:30 A.M. for the following purposes:

(1) Election of certain trustees in accordance with the By-Laws.
(2) Ratification of acts of the Board of Trustees and officers since the last annual meeting.
(3) Transaction of any other business that may properly come before the meeting.

Eli H. Mullinax, Secretary

Oren A. Oliver Honored by Tennessee State Dental Association

An orthodontist, and one of the most energetic and active men ever identified with the profession of dentistry, was honored at a dinner at the Peabody Hotel, Memphis, Tennessee, on the evening of May 1, 1960. The speakers included Charles Patton, president of the American Dental Association; Harold Hildenbrand, secretary of the American Dental Association; Gustav Korkhaus, dean of Bonn University in Germany; and many other dental speakers of note. The tribute paid Dr. Oliver by Mayor Ben West of his hometown of Nashville for civic work, particularly as chairman of the Nashville Aviation Commission, was extraordinary. Mayor West presented a plaque bearing Dr. Oliver's name, which will be placed in the new airport terminal at Nashville.

In addition to the many dental speakers and the presentation of numerous plaques and awards, R. H. Hutcheson, State Commissioner of Health of Tennessee, announced to the

audience that "no man can claim to have done more for public health" than Dr. Oliver. Other speakers, in summing up, said that in fifty-three years of practice Dr. Oliver has expended the energy of three men. He devised many of the present-day dental techniques of his field, wrote textbooks about them, worked on public health and civic projects and, as a sideline, became president of just about everything in sight. Dr. Korkhaus said: "The German association was not alone in finding it difficult to honor a man already so loaded with honors."

It could have been added to the above observations that Dr. Oliver has been one of the most active contributors to the creation and growth of the American Association of Orthodontists over a period of about forty-five years. He has served as sectional editor for the Southern Society of Orthodontists and as staff editor of the AMERICAN JOURNAL OF ORTHODONTICS for many years.

Pacific Coast Society of Orthodontists*

MESSAGE FROM PRESIDENT ALLEN (PETE) BISHOP

Each new administration of our component is faced with that ever-present spirit of competition. In our case it is going to be hard to equal the quality of the past administration which culminated with the Palo Alto meeting. This competition is good!

Worthwhile meetings don't just happen; they are the result of combined efforts of many men working as a team. Your new officers and committees are already formulating plans to have an outstanding meeting in Seattle, Washington, Aug. 6 to 10, 1961. We are confident that this will be at least equal in quality to the last one, and we are hoping that it may be just a little bit better!

Begin now to plan your summer vacation for 1961 to include your Pacific Coast Society of Orthodontists meeting in Seattle and to further enjoy the wonders of the Pacific Northwest, fishing, boat trips. Sounds intriguing, doesn't it?

An old Chinese proverb—"Kup—shi—hung—lok"— literally translated into English means "It is later than you think," which is applicable to us all.

Your friend,
Allen Bishop

RESOLUTION

Whereas, the Board of Directors of the Pacific Coast Society of Orthodontists has considered the present and future need for orthodontists in this geographic area, and looks upon it as one of our most pressing problems, we are dismayed by the number of unqualified persons attempting to undertake orthodontic services and by the establishment of self-styled "clinics" which profess not only to serve the public but to teach the specialty of orthodontics at the same time.

Whereas, it is an established fact that, while 50,000 children were graduated from high schools in California in 1950, 440,000 will be graduated in the same state in 1975. This ninefold increase in population will be augmented by an increased demand for orthodontic services, so that there is a clear need for 10 to 15 times the number of orthodontists in this period of time. If this need is not met by well-qualified specialists, the efforts of those who can only bring orthodontics into disrepute will be encouraged.

Whereas, we are pleased that the University of Southern California will resume its graduate program in 1960, and it is our hope that other dental schools not now offering

*Excerpts from the *Bulletin* of the Pacific Coast Society of Orthodontists.

post graduate instruction in orthodontics will soon plan to do so, for the consideration of other dental schools we commend the University of California for its orthodontic major known as "Curriculum II." Its graduates have proven their worth and have demonstrated how effective this mode of instruction can be. With the orthodontic major program safely out of the experimental stage, it should serve as an example to other schools of dentistry who might well emulate it, in order that more men may receive a thorough university education in the specialty of orthodontics.

Resolved: Letters be written urging the Pacific Coast dental schools to consider seriously a University of California Curriculum II type program in their teaching to help alleviate the shortage of orthodontists which is occurring.

PACIFIC COAST REPORT OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS MEETING

The fifty-sixth annual session of the American Association of Orthodontists was held at the Shoreham Hotel in Washington, D. C., April 24 through April 28, 1960. The registration was over 2,700 and the meeting was a very outstanding one. The Board of Directors met on April 23 and again on April 25. Many items of important business were transacted. We will elaborate more when the official copy of the Minutes is received. There will be a preregistration of all guests of at least sixty days before the annual meeting and not all that would like to come can be accepted. The associated members of the component societies will have a different status; they will also be dues-paying members of the American Association of Orothodontists. The Rules and Infractions Committee will have its work cut out for it in the coming year, studying and reporting on the conditions where a course, lectures, etc., can be given by a member of the American Association of Orthodontists.

The Education Report was an excellent one and the Qualifying for Membership Committee also presented the rules, etc., for preceptorship. It is much the same as the Pacific Coast Society of Orthodontists' preceptorship program. The American Association of Orthodontists' program will terminate in 1967 to conform with the American Dental Association rules. The insurance program is well on its way and will have a permanent committee to solve its problems. A new A. A. O., the American Academy of Orthodontists, has been formed in Wisconsin by general practitioners doing orthodontics; it has about 120 members. Members of the Pacific Coast Society of Orthodontists took an important part at the Directors' meeting, especially President Pete Bishop; President-Elect of the American Association of Orthodontists, Dallas Macauley; and Herbert Muchnic, Chairman of the Finance Committee. They all did a good job. Roy Curtner was named to the Public Relations Committee and Arnold Stoller to the Rules and Infractions Committee.

The scientific section was excellent. Tom Graber, General Chairman, and his good committee well deserve the fine compliments they received at the meeting. The presentation of the Albert H. Ketcham Memorial Awards to Sheldon Friel of Ireland and our old friend Charles Tweed of Arizona was a high point of the meeting. The president of the American Board of Orthodontics, L. Bodine Higley, made the presentation and it was well done.

There were a great many good table clinics and the Round-Table Discussion luncheon was oversold. There was tremendous enthusiasm for P. Raymond Begg from Adelaide, Australia. This man really has a message and those of you who have not made arrangements to see and hear him in San Francisco on June 20 had better hurry. Pages could be written about the technique he demonstrates, but you had better come and see it for yourself.

Dr. Charles Heston Patton
President-Elect of the American Dental Association

The American Dental Association has chosen Charles Heston Patton as its president-elect. He will be inducted into the office of president at the Los Angeles meeting next

October. The American Association of Orthodontists is proud of the honor which has thus been bestowed upon one of its members. Dr. Patton's contributions to orthodontics and to the advancement of dentistry in general cover a period of many years, dating back to the time when he was graduated from the University of Pennsylvania School of Dentistry in 1919. In addition to the many dental organizations which he has served as president, Dr. Patton is Assistant Professor of Cleft Palate Therapy at the University of Pennsylvania College of Dentistry. He is on the staff of the Philadelphia General Hospital and a member of the Rehabilitation Commission of the University of Pennsylvania Hospital.

Fabian Bachrach

CHARLES HESTON PATTON

While conducting a private practice in orthodontics and being active in dental and orthodontic organizations, Dr. Patton has been president also of the Philadelphia and Middle States Lawn Tennis Association. He has received the Award of Merit from the Dental Alumni and from the General Alumni Society of the University of Pennsylvania. He has served in the United States Naval Reserve and the United States Coast Guard Reserve.

We take this opportunity to wish Dr. Patton the outstanding success which we are confident he will achieve as president of the American Dental Association.

American Association of Dental Schools

The establishment of a Registry of Dental Faculty and Research Personnel has just been announced by Dr. Raymond J. Nagle, president of the American Association of Dental Schools. The Registry, administered by the Central Office of the Association at 840 North Lake Shore Dr., Chicago, Illinois, is designed to serve as a "clearing house" for dental education institutions and persons interested in teaching or research positions in the dental schools.

Qualified persons interested in obtaining a teaching or research appointment in dental education may file an application with the Association's office in Chicago. Dental schools and dental research institutions have been asked to report staff vacancies to the Central Office. The Registry will match applications on file with reported vacancies and acquaint

the schools with those persons who seem to have the necessary qualifications. Mr. Reginald H. Sullens, Secretary of the Association, emphasized that the Registry is not a placement bureau but pointed out that the Association felt that it could help in the more efficient distribution of dental teachers and researchers by "matching" jobs and applicants.

Information about the Registry program and copies of the application form can be secured by writing the Central Office, American Association of Dental Schools, 840 North Lake Shore Dr., Chicago, Illinois.

Notes of Interest

John R. Goode, D.D.S., announces the opening of his office at 847 West Ninth St., San Pedro, California, practice limited to orthodontics.

John Mather Jackson, D.D.S., takes pleasure in announcing that Evans Charlton Guequierre, D.D.S., is associated with him in the exclusive practice of orthodontics at 119 Coulter Ave., Ardmore, Pennsylvania.

Jerry E. Johnson, D.D.S., M.S.D., announces the opening of his office at 2018 West 66th St., Minneapolis, Minnesota, practice limited to orthodontics.

Seymour Levin, D.D.S., announces the removal of his office to 48 South Clinton St., Poughkeepsie, New York, practice limited to orthodontics.

Hyman S. Levine, D.D.S., announces the opening of his office at 490 Hialeah Dr., Hialeah, Florida, practice limited to orthodontics.

Paul S. Meyer, D.D.S., M.S., announces the removal of his office to Doctors' North-Roads Bldg., 9811 West Florissant Blvd., Dellwood, Missouri, practice limited to orthodontics.

Robert Minkoff, D.M.D., M.S., announces the opening of his office at 52 Lincoln St., Framingham, Massachusetts, practice limited to orthodontics.

George B. Travers, D.D.S., announces that his office is now located in the Medical West Bldg., 950 Francis Pl., Clayton, Missouri, practice limited to orthodontics.

Jay H. Young, D.D.S., announces the opening of his office for the exclusive practice of orthodontics at 419 Eldert Lane, Brooklyn, New York.

Forthcoming meetings of the American Association of Orthodontists:

1961—Denver Hilton Hotel, Denver, Colorado, April 16 to 21.
1962—Statler Hotel, Los Angeles, California, April 28 to May 3.
1963—Americana Hotel, Miami Beach, Florida, April 28 to May 2.
1964—Palmer House, Chicago, Illinois, May 10 to 14.
1965—Dallas Statler-Hilton, Dallas, Texas, April 25 to 30.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists
(Next meeting April 16-21, 1961, Denver)

President, William R. Humphrey - - - - - - - - - Republic Bldg., Denver, Colo.
President-Elect, Dallas McCauley - - - - - - 410 S. Beverly Dr., Beverly Hills, Calif.
Vice-President, Cecil G. Muller - - - - - - - - 101 S. 35th Ave., Omaha, Neb.
Secretary-Treasurer, Earl E. Shepard - - - - - - - 225 South Meramec, Clayton, Mo.

Central Section of the American Association of Orthodontists
(Next meeting Sept. 18-20, 1960, St. Louis)

President, Leo B. Lundergan - - - - - - - - - - 8000 Bonhomme Ave., St. Louis, Mo.
Secretary-Treasurer, Kenneth E. Holland - - - - - - 1019 Sharp Bldg., Lincoln, Neb.
Director, Elmer F. Bay - - - - - - - - - - 216 Medical Arts Bldg., Omaha, Neb.

Great Lakes Society of Orthodontists
(Next meeting Nov. 27-30, 1960, Cincinnati)

President, Hunter I. Miller - - - - - - - - - - - 1416 Mott Foundation Bldg., Flint, Mich.
Secretary, Edward A. Cheney - - - - - - - - - - 1201 Bank of Lansing Bldg., Lansing, Mich.
Director, Harlow L. Shehan - - - - - - - 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists

President, Kyrle W. Preis - - - - - - - - - - 700 Cathedral St., Baltimore, Md.
Secretary-Treasurer, Charles S. Jonas - - - - - - Mayfair Apts., Atlantic City, N. J.
Director, Louis E. Yerkes - - - - - - - - - - - 825 Linden Ave., Allentown, Pa.

Northeastern Society of Orthodontists
(Next meeting Nov. 14 and 15, 1960, Boston)

President, Henry C. Beebe - - - - - - - - - 60 Charlesgate West, Boston, Mass.
Secretary-Treasurer, David Mossberg - - - - - - 36 Central Park S., New York, N. Y.
Director, Norman J. Hillyer - - - - - - - 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists
(Next meeting Aug. 6-10, 1961, Seattle)

President, E. Allen Bishop - - - - - - - - - - - 703 Cobb Bldg., Seattle, Wash.
Secretary-Treasurer, Warren A. Kitchen - - - - 2037 Irving St., San Francisco, Calif.
Director, William S. Smith - - - - - - - - - 2530 Bissell Ave., Richmond, Calif.

Rocky Mountain Society of Orthodontists
(Next meeting Sept. 25-28, 1960, Santa Fe)

President, William A. Blueher - - - - - - - - - 801 Encino Pl., Albuquerque, N. M.
Secretary-Treasurer, E. H. Mullinax - - - - - - 8790 W. Colfax, Lakewood, Colo.
Director, Ernest T. Klein - - - - - - - - - - - 707 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, M. D. Edwards - - - - - - - - - - - - - - - 132 Adams St., Montgomery, Ala.
Secretary-Treasurer, William H. Oliver - - - - - - - 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley - - - - - - - 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists
(Next meeting Sept. 25-28, 1960, Kansas City, Kan.)

President, John W. Richmond - - - - - - - 493 Brotherhood Bldg., Kansas City, Kan.
Secretary-Treasurer, Tom M. Matthews - - - - - - 8215 Westchester Dr., Dallas, Texas
Director, Nathan Gaston - - - - - - - - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics
(Next meeting April 10-15, 1961, Denver)

President, Wendell L. Wylie - - - - - University of California School of Dentistry, San Francisco, Calif.
Vice-President, J. A. Salzmann - - - - - - - - 654 Madison Ave., New York, N. Y.
Secretary, Alton W. Moore - - University of Washington School of Dentistry, Seattle, Wash.
Treasurer, Paul V. Reid - - - - - - - - 1501 Medical Arts Bldg., Philadelphia, Pa.
Historian, B. F. Dewel - - - - - - - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Nathan G. Gaston - - - - - - - - - - - 701 Walnut St., Monroe, La.